

MOTOR AGE

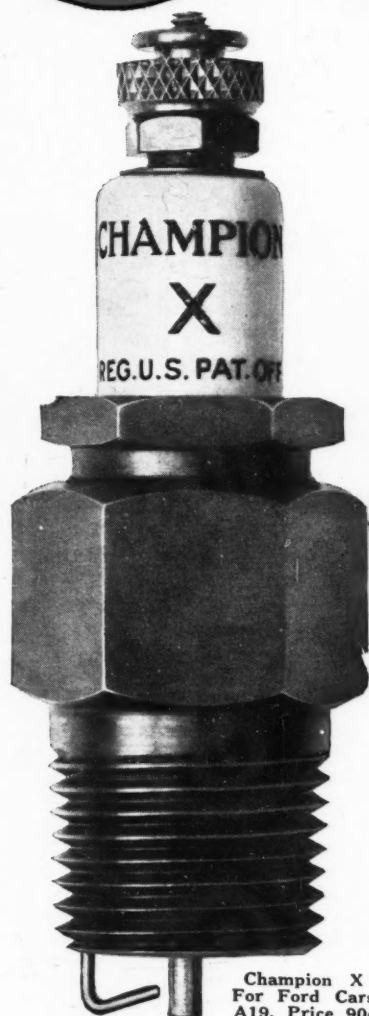
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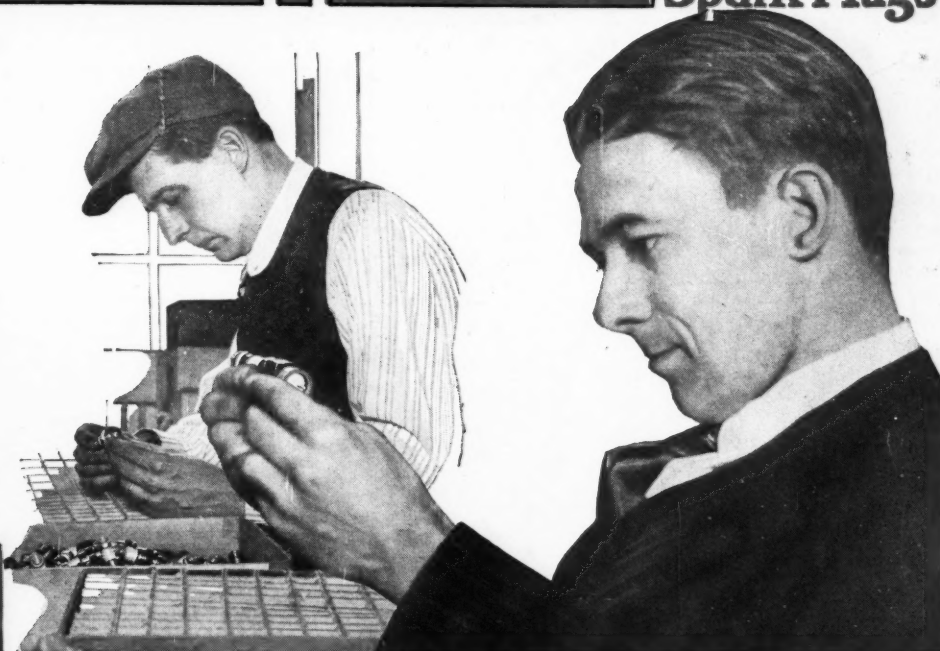
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Champion X
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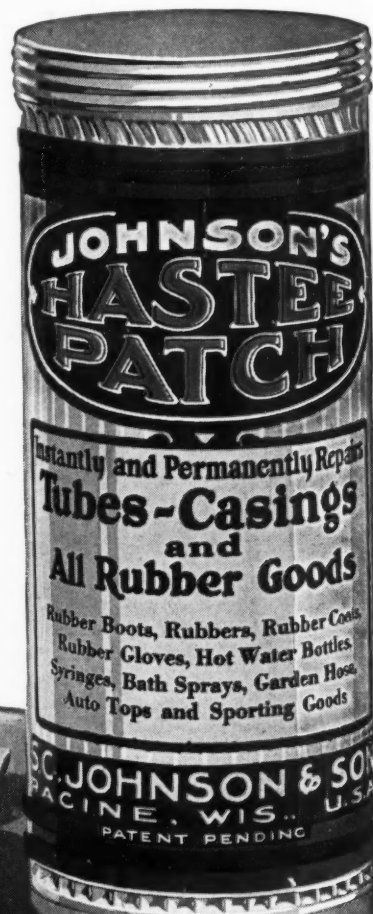
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MOTOR AGE

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Another Mystery Car What Is It?

Dealers Wanted! Ford Agents Especially!

For weeks New York people have twisted their necks as this car flashed by, crowds have gathered to admire and praise it wherever it stopped. When we photographed it in the Park, old gentlemen and babies followed to see what it was, so now we are going to tell you about it first!

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It is a ROLLS-ROYCE TYPE OF HOOD FOR FORD CARS!

That's not the whole story!

The hood has a new COWL to help complete the beautiful straight line effect.

And now this is the **BEST OF ALL!**

The Radiator shell is of **NICKEL SILVER**, and has **SHUTTERS** which can be closed to keep the heat in in winter and opened to admit air for cooling in summer!

The whole job is simply a "peach"!

There isn't a Ford owner anywhere who won't want it at sight. The agents who equip one of their demonstrator or service cars will have orders forced on them the minute their customers see it!

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And the price! The whole outfit—Hood, Cowl, radiator shell with shutters, and new lower half of windshield—sells to the customer for \$60.00 f.o.b. New York. And there's a good dealer's profit in it.

Tear out this page; pin your letterhead to it; say "Send us one"! That's all; we are sure of other orders from you.

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201 West 75th St.

New York



When Writing to Advertisers, Please Mention Motor Age

MOTOR AGE

The Dealer's Business with Good Roads

What Difference Does It Make to Me Whether the Roads Are Good or Not?—It Makes a Lot of Difference in Trade—Get Behind that Highway Movement—Be a Booster for Your Own Sake—You'll Be Doing Something for Both Your Country and Yourself Thereby

By Darwin S. Hatch

Managing Editor Motor Age

THE vast expansion in road improvement throughout the country which it was anticipated would commence with the opening of spring is lagging. Someone must get behind it—that's the dealers' business. It is doubtful that there will be half as much construction work on the highways during 1919 as was expected in January.

Chief among the reasons for this is the extremely high cost of road building materials, a factor which four months ago generally was expected would be much lower by this time. The road work which will be accomplished this season will only be a small fraction of the amount which could be accomplished with the funds available for the purpose. State and county road authorities in a great many instances are withholding asking for bids on road work plans and finance until material costs become more settled.

Immediate Action Is Economy

Projects for the improvement of 10,000 miles of road already are under way, but this is a small part of the construction that the funds available would provide for. The need for road improvement is so great that in many instances it would seem a matter of economy in the long run to go ahead immediately with a larger part of the work for which funds are provided even though it may have to be contracted for at a higher price than would be necessary with the work delayed several months.

There is no one class of men which has a greater financial interest, more to gain by road improvements than the dealers of automotive apparatus. It is, then, a part of the dealer's business to start and push

Coming!

SHORTAGE and high cost of labor, the high cost of materials and machinery and the Government restrictions on the purchase and shipment of materials are given as reasons for the greatly reduced highway construction during the last year. Read here the present situation.

That dealers have much to do with good roads is evident. Especially is this made evident as the touring season opens and approaches full speed ahead. There is going to be more touring than ever this year. Dealers should look for it and, having got it, make the most of their opportunities in this line. For this reason

CASHING IN ON TOURING

will follow this article, telling in the issue of May 8 how the dealer can seize this opportunity. Then, a week later, May 14, comes

GET READY FOR TOURING

which is particularly apropos in that it contains something many a dealer has been needing this many a day.—EDITOR.

the agitation for immediate initiation of road work in his locality.

There is only one way in which the dealer's efforts may be effective in this or in any other public movement. That is through organization. If you are not connected with an active trade organization, it is your business to get organized and get working. The road movement is only one of the many features of a trade organization's work, but it is a most important one.

It seems hardly necessary to point out that increased business for the dealer in cars, trucks and tractors, accessories and service, follows inevitably the extension of good roads in his territory. But there are short-sighted men in the trade who do not see that it is any of their business to take active part in highway improvement.

Bad Roads Close Shops

Iowa dealers will tell you that in a large proportion of the state they shut up shop practically all winter because the roads were impassable, and only in the larger cities could cars or trucks be operated on the roads at all. The market for cars and trucks in certain parts of the South is almost nil, simply because there are no roads fit to operate them on.

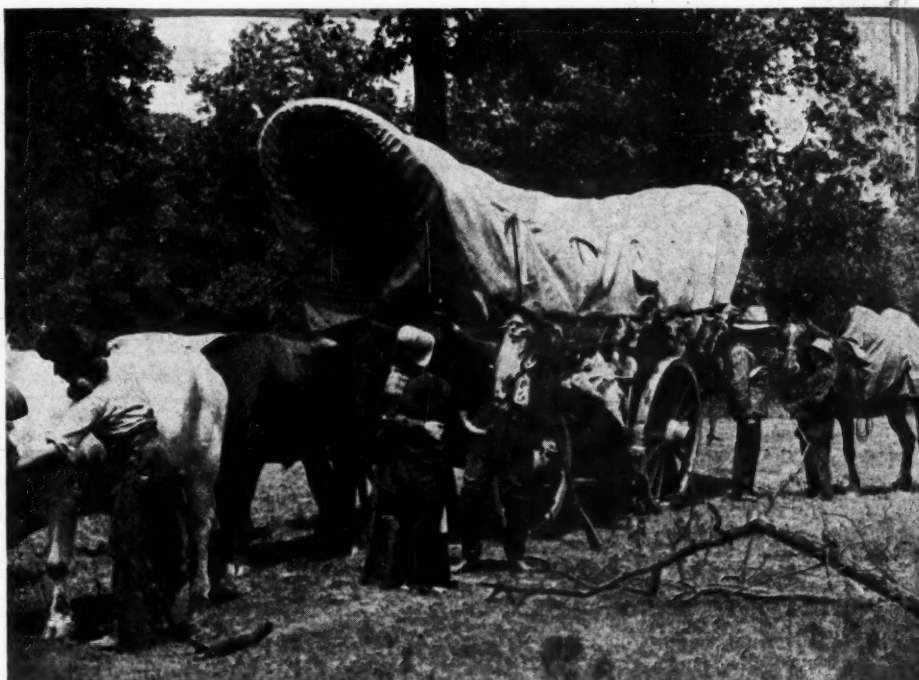
These conditions, of course, are extreme, but just so much as the roads in a territory are worse than the best, by just that much are the sales and business possibilities of the territory limited for the automotive dealers. It is no argument that at

Poor Roads Are Delaying Progress

Advices from a correspondent recently are to the effect that two motor truck lines out of Birmingham have been ordered suspended by Postmaster R. B. Smyer because they do not pay expenses. THEY DO NOT PAY EXPENSES BECAUSE THE ROADS ARE BAD, the postoffice adds.

This instance is not an isolated one. It is unfortunate that it is duplicated by similar cases. The highways of the country are inadequate for present needs, and they will be even more inadequate for the next year or so unless we get busy and make the roads better this season.

Good roads are demanded for the use of motors, and the use of motors is demanded in the common, everyday transportation of food and supplies. Railroad officials even go so far as to say that the railroad of the future may find it more economical to tear up short-line tracks and develop motor truck transportation in its place. Good transportation has evolved itself into two things—good roads and motor trucks. We need roads that stand the traffic.



Yesterday we traveled 10 or 15 miles a day. But we have stopped making transcontinental tours in prairie schooners and without roads

expects to put \$25,000,000 on its roads this year. Illinois and Indiana rank next to Texas. Indiana has 175 miles of its new market highway to take care of. Iowa is spending \$15,000,000 this year. Wisconsin is putting into effect a trunk system of roads which taps every community of the state.

Highway associations have been very active in seeing that state and county appropriations be concentrated where possible upon their highways. In doing this

they have made certain that main roads connecting large cities in most instances shall have the preference with the feeders and side roads also getting consideration. On the Lincoln highway \$12,000,000 will be spent this year, if the road work planned gets under way in time. This is four times as much as was spent on it last year. There are now 800 miles of concrete brick or bituminous macadam on the Lincoln highway. The Dixie highway will be hard-surfaced through Illinois, most of Indiana and a part of Alabama and Georgia. The Yellowstone will benefit greatly by state and Federal appropriations in the states through which it passes. There is \$12,000,000 available this year in those states. On other highways sponsored by organizations, a great deal of work will be done, but plans have not materialized sufficiently to make definite statements.

A new highway through the Northwest has been projected as a transcontinental road in honor of the memory of Theodore Roosevelt and to be known as the Theodore Roosevelt Memorial highway. There are two or three different Pershing highways, one of them being a new route to be known as the Pershing highway and transcontinental. In addition the Pike's Peak-Ocean-to-Ocean route is changing its name to the Pershing Transport route and says that Pershing has cabled his consent.

Banner Touring Year

With all this work planned, the interest in touring promises to be greater than it was in 1916, the banner touring year. Hotel men, chambers of commerce and all business organizations in towns and cities located on the main touring routes are making plans for a large tourist trade. In some instances the dealer organizations and the dealers as individuals also are getting busy. But dealers who are on touring routes and do not prepare to take advantage of the business that the roads bring to their doors will miss a great opportunity.

What the Chart Has to Say

THE Wisconsin Highway Commission made an investigation of the increase in the cost of roads as compared with the increase in prices received for various farm products. This was published in its fourth biennial report, and took into account the relative increase in the cost of roads and of other commodities from 1913 to 1918, inclusive. The investigation shows that: In 1913, 100 lb. of hogs would pay for 5.6 sq. yd. of concrete road; in 1918 the same weight would buy 9.2 sq. yd.—an increase of 65 per cent.

In 1915, 100 lb. of milk would pay for 4.6 cu. yd. of grading; in 1918 it would pay for 6.9 cu. yd.—an increase of 50 per cent.

In 1913 a bushel of wheat would pay for 1.9 sq. yd. of stone macadam; in 1918 for 2.8 sq. yd.—an increase of 47 per cent.

These are only three of the deductions as to cost of road building. But this will confirm what the chart shows, namely—

The cost of road work has not increased as has the price of Wisconsin farm produce during the period treated.

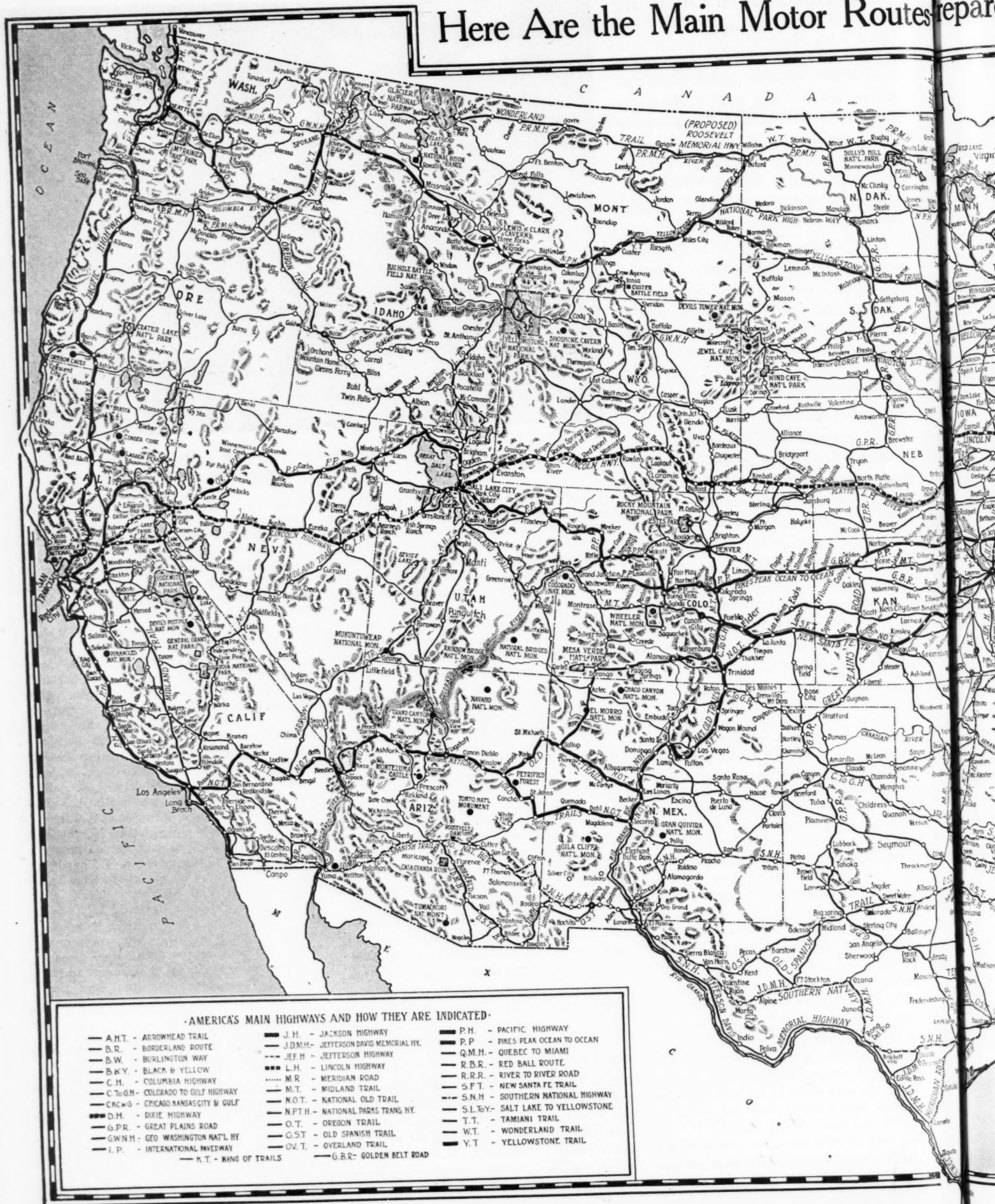
In other words, says Wisconsin, **WE CAN BUY ROADS MUCH CHEAPER NOW—**

IF WE EXPRESS COST IN TERMS OF PRODUCE, NOT DOLLARS—THAN IN 1913.

The average prices for 1913 are used as a basis—100 per cent—and the average prices of subsequent years were ascertained and the percentage that these averages were of 1913 were plotted. Average prices were derived by adding the twelve average monthly prices and dividing by twelve. This gives the curves showing the relative increases, each one of which is labeled for the commodity treated. Thus, corn in 1914 was worth 13 per cent more than in 1913; in 1915, 18 per cent; in 1916, 34 per cent; in 1917, 166 per cent; and in 1918, 168 per cent, etc.

Chicago board of trade prices were used for commodities handled by that body; hog prices, from Swift. Milk is the average of two Wisconsin condenseries. Wages are from the Wisconsin Industrial Commission, and road prices from the records of the Wisconsin Highway Commission. It should be remembered that the percentage of increase probably would be correct whether the local prices anywhere were higher or lower than at the basic points used.

Here Are the Main Motor Routes



Huge Car Shortage in All Sections

Big Plants Nearly at Normal Production but They are Swamped with Orders

DETROIT, April 25—There is a tremendous shortage of cars in all sections of the country. While the big plants now are making nearly as many a day as in former years and their production will be normal within thirty days, the unusual demand of the motoring public has swamped them with orders.

Ford, owing to its mammoth production facilities and extensive merchandising system which reaches every milking corner of the country, is perhaps the best criterion of conditions everywhere. For the last four years this company has had approximately 100,000 unfilled orders on hand at all times. The company now is getting into big production again, and April 24 it had 69,994 unfilled orders for immediate shipment. These orders are increasing daily in spite of the fact that the company is now running 2600 cars and will be producing 3000 cars daily within the course of the next ten days.

The condition is almost similar with Cadillac, which has approximately 4500 unfilled orders on hand. Its distributors are clamoring for cars in every section. The company is boosting production as fast as possible, but officials state that it will be several months before they will be able to catch up with the demand. Cadillac conducts its own sales and distribution work here. This station, which cares for the Detroit district only, is 100 orders behind and is selling its cars as fast as they receive them.

Seventy Paiges a Day

Paige-Detroit, now running approximately seventy cars a day, is unable to begin to supply the demand. If this company could double production to-morrow, it would still take months to catch up with its orders.

Hudson proposes to manufacture 200,000 Essex and 200,000 Hudson cars this year. It has twenty dealers who have sold their entire allotment for the year. These dealers, if they desire to continue in the business, are up against the proposition of getting an increased allotment from the company, which in the face of present conditions is going to be very difficult, or take on some extra line to keep them busy. Hudson is rushing work on its new Essex plant, and it is probable both Hudson and Essex production will be increased materially if present conditions continue.

An unusual situation is developing, and that is the used car problem. Few people purchased any cars during the war. Fifty per cent of the car purchasers turn in their used cars as part payment for new ones. This is flooding the used car market. The demand for cars is so great, however, that the buyers are snapping up every desirable machine, whether new or used. While this situation is taking care of itself very nicely at present, it is already apparent that before the end of the year the average dealer is going to have a large stock of used cars on hand, and it is going to be necessary for

him to specialize in the merchandising of used cars more than ever.

The used car is the rock on which many companies have foundered, and the problem is bound to be a very important one this year. The sales heads of the big factories here as well as the average dealer are keenly aware of this situation. The factories already are coaching their distributors in used car merchandising methods, advocating new painting, some remodeling and, in many cases, custom-made bodies as a means of promoting sales. With present conditions existing, even cars of obsolete models are being snapped quickly up after being attractively fixed up by the dealers.

Willys-Overland has scores of distributors who have sold their entire allotment. Many of these dealers have taken orders far in advance of their allotment, and the company is up against a big problem in meeting its demands. The company is arranging now to get into production upon its new model, a light four, and it is planned to do this without curtailing in any way the production of its other lines. The company is running approximately 600 cars a day, while its orders for machines are several thousand cars ahead of production.

While Packard is just getting into production, its dealers in every section are pressing it for cars, and hundreds of orders are piling up in its sales department. Work at the plant to get into production is being pushed to the limit, but owing to the fact that the company has lost several months of the year, due to the necessity of practically remodeling the entire plant to again handle peace work, its production is bound to fall far below the car demand. This company has not a single distributor but who would take every car the company could ship him. Dozens have completely sold their allotments. This company makes fifteen different body types and the demand is equally great for all.

Hupp Schedules 18,000

Hupp production schedule calls for 18,000 cars this year. The demand to date is practically 50 per cent greater than production. Sales officials say 30,000 Hupmobiles could be sold within the next eight months if the factory were able to produce them. This year's production is 50 per cent greater than that of any previous year. Every dealer is oversold and is constantly urging greater car shipments. The company had 2500 unfilled orders on its books to-day.

So great is the demand for Dodge cars that company is coaching its dealers in how to turn down orders gracefully without antagonizing the trade. It is telling its dealers the company cannot hope to produce enough cars to meet the demand. The production system used by Dodge Brothers is rather unusual in that it fixes no net production for the year, aiming to produce just as many cars as is possible each day. The company is running between 500 and

550 cars daily, yet is hopelessly behind in orders. Within the last ten days thousands of letters and telegrams have been received from dealers in every section of the United States urging immediate shipment. Some dealers are 100 per cent oversold, the great majority being unable to promise delivery within from three to six months.

Reo has orders ahead for 4000 cars. Owing to the immense amount of work necessary to make this shift from war to peace basis, this company is not yet in full production. In certain departments a great deal of Government machinery is stored, and it will be some time before the entire facilities of the establishment will be available. The car shortage is very pronounced in every section. The company is now running approximately sixty cars a day, but owing to its inability to reach capacity production, no annual production schedule has been made. The company has 1800 distributors, 90 per cent of whom have sold their quota for months to come.

BUSINESS GOOD AT SPRINGFIELD

Springfield, Mass., April 26—The dealers here are enjoying an era of prosperity these days, and they cannot get enough cars. New agencies are being placed, showing that the dealers have confidence in the future. R. A. McKee, the Massachusetts Motors, has taken on the agency for the Standard eight. Joseph L. Finkel has added the Studebaker line to his list, and the Parmenter-Graves Co. has taken on the Saxon six. R. M. Saues, who has the Federal truck agency for Hampshire, Hampden and Franklin counties, has branched out and added Worcester county to his territory. E. B. Wilson, branch manager for the Willys-Overland here, has been promoted to take charge of the company's branch at Los Angeles.

WALLIS TO DOUBLE OUTPUT

Racine, Wis., April 29.—Production of the Wallis tractor is to be more than doubled within the next month. Commencing tomorrow the factory will be partially closed for the installation of new manufacturing equipment and a progressive assembly system.

It is estimated that the plant will be in complete production by June 1, increasing from its present rate of ten tractors per day to twenty-four tractors per day.

TRACTOR SALES PICK UP

Des Moines, Iowa, April 26—The last ten days have seen a decided improvement in tractor sales and prospects, according to Des Moines dealers and distributors. Part of this improvement is attributed to a week or so of clear weather after a period of two to three weeks of almost constant rain. The rain was just the thing to put the soil in good shape, but it did not tend to help sales any. A week of sunshine has overcome this gloom and business has started off with a rush. The week has seen a new firm enter the tractor field in Des Moines. The Parritt-Denman Co. has been incorporated with a capital stock of \$60,000 and will handle a large territory in Iowa for the Cleveland tractor. Frank T. Parritt and Milton Denman are the incorporators. As an evidence of the growth of the

automotive industry in Iowa the entrance of the Herring Motor Co. into the Kansas and Missouri territory is noteworthy. May 1 the Herring company will send eight salesmen into Kansas and Missouri to remain permanently to cover the field in those states for the accessory lines handled by the firm. C. L. Herring, head of the company, is of the opinion that the present is the psychological time for expansion of the automotive business and is ready to back up his idea.

NEW YORK PLANS EXPANSION

New York, April 28—The New York Automobile Dealers' Association, which was not very active or financially strong until it held the last New York show, now plans to extend its membership and do a lot of things it has longed to do for years. It is considering altering the constitution and by-laws to admit other than dealers. The dealers will be first grade members, but, in addition, there will be several kinds of associate members, thus bringing the various elements of the whole trade into one organization.

A new home for the association has been secured at 1845 Broadway, above the Colt-Stratton Co.'s salesroom. Here two floors will be occupied with offices, club rooms and a restaurant. The trade has long felt the need for a gathering place of this kind. Manager Charles A. Stewart, who has handled the organization's affairs for eight years, has resigned to engage in other activities. His successor has not yet been chosen.

DETROIT ISSUES USED CAR REPORT

Detroit, April 26—The Detroit Automobile Dealers' Association will endeavor to stabilize conditions in the local trade by issuance of a used car market report. It will be furnished to members semi-monthly, who then will be able to appraise the true value of used cars. A second reform to be introduced is the compilation of list prices on all standard makes of new cars for distribution to association members. To carry out these objects H. H. Stuart, who has acted as manager for the association's shows, has been made assistant secretary and treasurer of the association with a downtown office.

In the past Detroit dealers have been dependent upon a nationally used car market report issued by the Chicago Automobile Trade Association as their only means of judging used car values. This report has no direct bearing on local conditions. Each dealer will keep a record of his used car transactions, which will be gathered at the association offices, averaged, and the figures sent out so that dealers will have the average price as a guide.

GARAGE OWNERS HOLD DINNER

Boston, Mass., April 26—More than 100 garage owners, most of them members of the Garage Owners' Association of Metropolitan Boston, held their first dinner here Thursday evening. Col. W. D. Schier, chairman of the Massachusetts highway commission, and Frank Lewis and John R. Murphy, fire commissioners, were among the speakers. J. F. Fleming of the Brookline Garage was toastmaster.

These Succeed Ford Men Who Left

Changes in Organization Fill Positions of Resigned—General Conditions at Plant

DETROIT, April 26—New executives have taken hold of the important posts at the Ford Motor Co. to fill the positions of those who have resigned lately. It has been a matter of great interest to know something of those who now hold the reins. In repairing the holes in the organization caused by resignation, the Ford company has taken men from within the organization. The following is a resumé of the general condition at the plant:

Norval A. Hawkins, who was chief of sales almost from the time the Ford car was made, has been succeeded by William A. Ryan, his former assistant. Two years ago the Ford company abolished its retail sales department and since that time has been merchandising its cars through a distributors' organization. Mr. Ryan has been in charge of building up this distribution and dealers' organization for several years, while Mr. Hawkins, who supervised the entire department in a general way, devoted most of his time to retail sales. When the retail sales department was discontinued the major part of Mr. Hawkins' labor became unnecessary and, according to the Ford company, the present department, headed by Mr. Ryan, was thoroughly capable of handling all present work.

It was stated unofficially at the Ford plant to-day that William B. Mayo, construction engineer, will succeed C. Harold Wills, formerly the chief engineer, who resigned a few weeks ago. Mr. Mayo at present is directing all engineering work, assisted by M. M. Wibel, who has been with the engineering department for several years. Charles Mongana, Jr., who was in direct charge of the engineering department under Mr. Wills, resigned and is now associated with his former chief in a new motor car project. Mr. Wibel was Mr. Mongana's assistant and he merely assumed Mr. Mongana's duties when the latter withdrew from the company.

No Successor to Lee

John R. Lee, who was in charge of the social, welfare, profit-sharing and bonus departments, has no successor as yet. It is very likely that the name of a new official will be announced in a short time. C. A. Brownell, advertising manager, has assumed some of Mr. Lee's former duties, it is said. The rest of the work is being handled by his former assistants.

The Ford Motor Co. is very secretive regarding conditions which brought about the big upheaval in the ranks of its officials. There are many rumors which hint of trouble between Edsel Ford, president of the company, and the men who resigned. This may have been true in the Hawkins case, but there is little evidence to substantiate this in the cases of Mr. Lee and Mr. Wills. It also is rumored that both the latter men quit to become again associated with Henry Ford in his proposed \$250 car project, preliminary plans for which are already under way. Mr. Wills

states that he is going in business for himself. Owing to the personal feeling between Mr. Wills and Mr. Mongana, it is very apparent that Mr. Mongana resigned wholly to join Mr. Wills in his new venture and that his connection with the Ford company was congenial until the last.

The Ford company is now about to hit its full production stride. From 1300 cars daily this company has run production up until an average of 2600 cars were turned out each day this week. According to production officials, the first of May will see production boosted to the 3000 mark, and every effort is now being made to increase this production as high as 4000 cars daily, if possible, to meet the unusual demand.

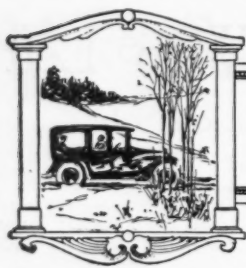
Change in Production

In November the Ford company was operating on practically 100 per cent war basis. Ford did not wait for the cancellation of his contracts, but suspended all war operations the day after the armistice was signed. As a result he began his work to get back into peace production several weeks before any other automotive company in this district. This foresight enabled him to be operating on a 50 per cent basis by the first of the year, and he will hit his full production stride long before the other company have fully recovered. April 24 the Ford company had on hand 69,994 unfilled orders, and this total is increasing every day. From Aug. 1, 1919, to Aug. 1, 1920, the Ford company plans to manufacture 1,000,000 cars.

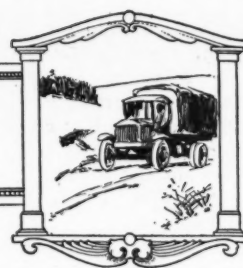
BROWNE GETS AN AIRPLANE

Milwaukee, Wis., April 26—The first commercial airplane to enter the confines of Wisconsin arrived in Milwaukee to-day for delivery to George W. Browne, Inc., which is distributor of the Overland line and, since Jan. 1, representative of the Curtiss Aeroplane & Motor Corp. The Curtiss was flown from Ashburn Field, near Chicago, to Lake Park, Milwaukee, by Lieut. Gilles E. Meisenheimer, who recently received his discharge from the Canadian Royal Flying Corps, in which he served as instructor at Camp Borden, Ontario, for more than a year. Lieut. Meisenheimer is now a member of the George W. Browne staff, in charge of demonstration and instruction in the aircraft department.

The machine is a Curtiss tractor, model JN4-D2, with a maximum speed of 80 m.p.h., powered with an eight-cylinder V-type Curtiss OX engine of 90 hp. at 1400 r.p.m. A stock of aircraft parts has been received by the Browne company. One or two additional demonstrating machines will be delivered during May, it is expected. Several machines have been sold to Milwaukee young men and six more in Minnesota. Deliveries probably will be made by mid-summer. The demonstrator will make daily flights in Milwaukee and through Eastern Wisconsin during the Victory Liberty Loan 've.



EDITORIAL



Hibernating in the Road

THAT the quality of the roads affects the sale of cars and trucks is a statement that few dealers will question, but it is doubtful whether most of them realize how much of a determining factor the condition of the roads really is. In most parts of the country the roads are at least passable the year round. There are, however, many sections in which for long periods motor vehicle traffic is out of the question.

THERE is no better lesson in the value of good roads to the trade than the experiences of the dealers in some of these sections in which all-year roads are unknown. In such territories you will find the automotive trade practically hibernating until nature takes it upon herself to dry up the mud and let business go on again. Not only must car owners lay up their cars but dealers find sales impossible.

Service Jobs Completed on Schedule

NO better wall slogan could be hung over the entrance of any service department than "Service Jobs Delivered on Schedule," provided you live up to it. The failure to get a car from the repairshop on the day it was promised—or the hour—has caused more antagonism to the service station—well, almost as much as poor workmanship and high bills.

HERE is a case: A business man driving to work in the city plans to call at the service station, have his car trouble diagnosed and leave instructions for the work and have time to reach his office at the opening hour.

HERE is what happens: At the service building no one can be found who can take a list of what has to be done on the car. He waits 5 min. 10 and, it may be 15. At length he gets a man to do the job. It is done in less than 2 min. Then comes another delay. He waits while the order is typed. There is an error, more time is wasted and he finally gets away from the service building 15 min. late and perhaps is that late for his office.

THE car is promised at 6 that evening. It might be ready by noon. He goes to dinner at 6 and at 9 drives over for his car to find the work not more than half completed. No effort was made to advise his office that the job would not be ready. It was just a case of as stupid business as might be encountered in the poorest of business places.

THIS is not an extreme case; it is a very frequent one. It happens in a great many cities. It happens every day in nearly every city. It happens every day in some service stations. It is the surest way to creating sales resistance.

IT is due to bad business. The job was not started in time. It was poorly superintended and when closing time came there was no checking up of the jobs that had been promised. Bad business scarcely expresses the situation. It is rotten business. It is just such service that has chilled many a farmer who was a gilt-edged tractor prospect. Just such service has made many a man buy a different make of car. Such service is a millstone on the neck of the motor industry.

Standard Tractor Ratings

THE recent action of the tractor division of the National Implement and Vehicle Association in appointing a special committee to take up with the United States Department of Agriculture the possibility of establishing a governmental sanction for standard tractor ratings is a long step in the right direction. This is a matter which should have been attended to long ago. But, judging from previous conditions, there is some doubt if constructive action will be taken.


HERETOFORE it has seemed to be impossible to bring about a reform in tractor rating because of the reactionary and ultra-conservative stand of some of the manufacturers. Some of them have consistently refused to co-operate in that direction. It is for this reason that some question exists as to the possibility of real action.

HOWEVER, the present irrational method of rating tractors is coming in for pretty general condemnation. It is beginning to dawn upon the minds of the tractor manufacturers that

the present method is no criterion by which to estimate the respective drawbar pull of various machines, that it is misleading to the dealer and the farmer, that it is an encouragement to over-selling and that it is likely to result in permanent injury to the tractor trade.

THE farmer, after all, is most to be regarded in this respect. As tractors now are rated he can tell very little about whether any given tractor will come up to the representations made for it. He has suffered extensively in the past from this cause, and where he has the power he is taking measures to protect himself. Such was the rude jolt administered the tractor trade by the "reasonable time" law recently enacted in North Dakota.

FOR these reasons it is to be hoped that something may result from the action that has been taken by the national association. The very fact that the matter is under advisement is encouraging.



Finish the Job Let Your Dollars Back What Our Boys Won *Victory*

—BUY A BOND—

TO speed up peace billions were spent to equip the most wonderful army ever known. Other billions were put in ships to carry that army overseas. America surpassed her wildest dreams and accomplished the impossible. It took money to do it. But because that money was spent freely victory came sooner.

Every day the war was shortened thousands of lives were saved. For every day it was shortened the boys will be returned to their homes that much sooner.

To win the war America sacrificed dollars rather than American lives. Money spent may be regained, but a life lost never can be replaced.

To win the war and save lives money that was not on hand was spent. The credit of the nation was pledged for victory. Now more money is needed to pay the bills—the debt incurred that the life of many might be saved.


Money is needed to bring back the boys now overseas. Money is needed to complete the reconstruction—to “Finish the Job.”

It is up to us all to do our full part in floating the Victory Liberty Loan. Nor should we be any slower to respond to such appeal than last November, when we emptied our purses so willingly.

For the Fourth Liberty Loan—the Fighting Loan—the almost inconceivable sum of \$6,000,000,000 was asked to prosecute the war. What the answer was is history. Americans not only met the call but threw in another billion for good measure.

The Victory Liberty Loan asks for much less—\$4,500,000,000. It offers exceptional advantages as an investment with its $4\frac{3}{4}$ per cent bonds exempt from all tax except estate or inheritance tax and income surtaxes and its $3\frac{3}{4}$ exempt from surtax also. It matures in four years. How big a slice of Victory do you want?

—YOURS FOR THE VICTORY LIBERTY LOAN—



St. Louis Dealers Plan Truck Week

Hope to Send Train of 100 Vehicles on Five-Day Trip Through State

ST. LOUIS, Mo., April 28—St. Louis truck dealers are planning a truck week beginning June 2. On that day they hope to start a train of more than 100 trucks on a five-day trip through Missouri. These trucks will be loaded with speakers on good roads, trucks, business and so on, and alfalfa, wheat, drygoods, calves, pigs, cattle, milk cans and other things usually hauled on trucks or which the truck men think should be hauled on trucks but are not.

The suggestion for this move came to the Truck Dealers' Bureau of the St. Louis Automobile Manufacturers' and Dealers' Association through Harry G. Moock, business manager of the N. A. D. A. Mr. Moock's idea is national, but he proposed it to the St. Louisans to see how they would take to it. After an enthusiastic meeting they named a committee of which Frank Martin of the Martin Truck Co. is chairman. This is canvassing the trade to see how many trucks will join. The advance prospect is excellent.

Saturday Ed Peake, the Kansas City organization expert and trade promoter generally, and H. M. Genung, secretary of the H. A. Dougherty Motor Co. and of the Kansas City Truck Body Mfg. Co., Kansas City, visited the N. A. D. A. offices. The project was placed before them, and they are going home to "whoop it up."

Here is the N. A. D. A. view and why this was suggested. Mr. Moock and his associates have been putting a lot of time on the truck situation since the report of the War Department sales came up. They have excellent reasons to believe that this report is to-day the greatest evil in the truck world and is responsible for much hesitancy in business, so they looked about for a cure. The idea is for a national truck day, but because there is so much difference

in dates, etc., and because the season already is late, the national truck day necessarily will be celebrated on different days. June 2 probably will be the day in St. Louis, because this is about the last date on which to get to the farmers before harvest and about the earliest date for which the enterprise can be got under way.

This week the N. A. D. A. will take this matter up with truck manufacturers and see if it is not possible for them to take the national truck day up in their national advertising.

The speakers carried by the St. Louis train, it is planned, will talk chiefly business and good roads. A part of the business talks will be on the price situation and they will carry everywhere the latest information on War Department trucks.

SHIP-BY-TRUCK IN OMAHA

Omaha, Neb., April 25—The Firestone Ship-by-Truck Bureau has plunged into development of motor truck service, in this territory with both hands and feet. W. B. Alexander, manager of the Omaha Firestone branch, calls his venture "the establishment of a clearing house for all information regarding truck routes, shippers and schedules." He cheerfully assumes a labor which the Omaha Chamber of Commerce abandoned after trying out a return local exchange in South Omaha because it did not prove profitable to the agent. Mr. Alexander is dead sure the thing can be done. Anyway, he proposes to find out.

"What we want first," he says to truck owners, "is information regarding routes. Send in the description of your route, you drivers—what towns you make and what your schedules are. Get your shippers to write us of their needs, and tell them we want to know all their troubles. Get on the job right now. Two weeks hence we

propose to issue an advertisement showing routes, rates and schedules, and we want to run this ad every month hereafter, revised with each issue to be up-to-date."

Mr. Alexander frankly admits he probably will not make any money out of the proposition, at least within a few years. But he predicts that within five years the railroads will have no 50-mile hauls left, as these will be handled by trucks.

The plan is to have the truck lines work both ways through the guidance of the ship-by-truck bureau. A local freight house is among the developments expected, with prepay arrangements through the truck drivers.

MIDWEST TRADE FETES RICK

Chicago, April 25—Maj. Eddie Rickenbacker, America's ace of aces, was welcomed to the Middle West Wednesday night by the motor trade of Chicago and surrounding territory at a banquet which formed the climax of Rickenbacker day in the Liberty Loan drive. Eight hundred diners joined Lieut. Col. H. M. Byllesby and George M. Graham, chairman of the motor truck committee of the National Automobile Chamber of Commerce, in characterizing Rickenbacker as the epitome of the motor industry's effort in winning the war. The banquet was held under the auspices of the Chicago Automobile Trade Association, the Chicago Automobile Club and the Aero Club of Illinois. The former speedway champion headed a long parade staged by the trade association in his honor at noon.

WOULD ANNUL CROSS-LICENSING

New York, April 26—Suit to annul the patent cross-licensing agreement has been brought by the Locomobile Co. of America, whose president, Andrew L. Riker, was a vice-president of the N. A. C. C. when it adopted the plan and who is now on the patent committee, against the National Automobile Chamber of Commerce. The importance of the suit may be judged in part by the fact that in principle it involves some 500 patents which, since the



The Chicago trade and motor clubs joined in staging this banquet for Maj. Eddie Rickenbacker at Chicago

agreement became effective, Jan. 7, 1916, have been pooled by the 112 members of the association.

The suit is entirely a friendly one. The relations between Locomobile and the N. A. C. C. always have been entirely cordial. Locomobile believes, however, the patent cross-licensing plan operates to defeat inventive genius and to "obstruct and prevent the natural development of the motor car."

JAMES VILES DIES

Harvey, Ill., April 29—James Viles, chairman of the board of directors of the Buda Co. and father of L. M. Viles, president of that company, died in Chicago Sunday of a complication of diseases. Mr. Viles was born in Boston March 10, 1865. Previous to becoming president of the Buda Co. in 1907, he was in the packing business in Chicago and senior partner of Viles & Robins and of the Omaha Packing Co.

Coatalen Arrives

New York, April 28—Louis Coatalen, managing director and chief engineer of the Sunbeam Motor Car Co., Ltd., Wolverhampton, England, has arrived en route to Indianapolis for the 500-mile Liberty sweepstakes to be held May 31. He has brought with him two specially designed Sunbeam cars which are entered for the race and of which the drivers will be Jean Chassagne and Dario Resta.

The cars are fitted with six-cylinder ball-bearing crankshaft engine with 80 by 150 mm. bore and stroke. They develop 152 hp. at the normal crankshaft speed of 3000 r.p.m. They are fitted with four-speed transmission systems and have a wheelbase of 108 in. The front tires are 34 by 4½ in. and the rear 35 by 5.

The presence of Mr. Coatalen in this country as manager of the Sunbeam team is an indication that the company is making a serious effort to win the race. An interesting fact in connection with the coming of the team is that they were not able to bring over mechanics owing to inability to secure passports which would insure the arrival of the mechanics in this country before May 18. They hope to enlist the aid of one or more American manufacturers in securing competent assistants for their drivers.

The two Sunbeam racing cars have not yet been tried out for extreme speed owing to the fact that they are too fast to be run over the roads and there is no suitable test track at the present time in England. Brooklands track has been badly torn up because of heavy hauling done over it by trucks running into and out of a large aviation field which was maintained there during the war. Besides being out to win the 500-mile, Mr. Coatalen says they will also try for the 1-hr. record on the Sheephead Bay track before the cars are shipped back to England. An effort was made to arrange for this trial before the cars left New York for Indianapolis, but it was impossible. This record was held by the Sunbeam before being broken recently by the Packard driven by Ralph de Palma.

State Test of Tractor Before Sales

Nebraska Will Try Out One Sample of Each Make—Must Stock Repairs

OMAHA, Neb., April 25—Two bills passed by the session of the Nebraska legislature just closed have an important bearing on the sale of cars, trucks and tractors in this state. It is believed the general effect will be a tendency to centralize the business in the larger cities of the state.

House Roll No. 85 provides that no tractor shall be sold in Nebraska until a sample machine has been tested by three competent engineers of the state university at Lincoln, who shall report to the state railway commission. The commission will compare this report with the specifications and claims of the manufacturer or agent as set forth in advertisements or sales arguments and shall deny permit for sale if these specifications or claims shall be found to be false in any way.

The commission also is given power to deny sales permit for any tractor on complaint of any two bona fide customers, properly substantiated, that an adequate service station, with full supply of parts, is not maintained within the state. The law becomes effective July 15.

The second bill, Senate File No. 86, declares the sale, trade or disposal of any car or tractor void unless the necessary supplies and repairs are carried at some point within the state, this measure being very similar to the first. It differs in voiding the sale after consummation, as against forbidding sale beforehand. This law is effective July 18.

Four French Racers for May 31

Thomas, Guyot, Wagner and Bablot to Drive

PARIS, April 28—Special cable—Official entry for the Indianapolis 500-mile sweepstakes May 31 has been made for four eight-cylinder racing cars manufactured by the Ballot Co., Paris. The four drivers named are Rene Thomas, Albert Guyot, Wagner and Bablot. The cars were built especially for Indianapolis conditions in 103 days, designed by Henry, designer of Peugeot cars and having vertical cylinders. Drivers and cars sailed for New York on the Savoy April 26.

MUST KEEP REPAIRS

Chicago, April 26—North Dakota farmers will be protected in the matter of repair parts for automotive equipment through the operation of a law passed by the last assembly, as follows:

On and after the taking effect of this act it shall be unlawful for the manufacturers of any gas or oil-burning tractors, steam or gas engines, harvesting and threshing machinery, automobiles and auto trucks, to sell or deliver within this state any such gas or oil-burning tractor, steam or gas engine, harvesting and threshing machinery, automobiles or auto trucks without having

first established at least one supply depot within the state where shall be kept constantly on hand a full and complete supply of repairs for the same.

Any manufacturer selling or delivering, or causing to be sold or delivered, any such machinery in violation of this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than \$25 and not to exceed \$200 for each offense.

The reasons lying behind the passage of this provision are that in the past the Dakotas have furnished a convenient experimental ground for the trying out of new equipment and for the sale of equipment made by concerns of doubtful financial responsibility. The result has been that many orphan machines have been left on the hands of the farmers for which it was impossible to obtain repairs. Either the company putting out the experimental machine went out of business or discontinued the model, or the financially weak companies went by the board entirely, leaving their product stranded.

ENTRIES FOR TACOMA

Tacoma, Wash., April 28—The Tacoma speedway already has signed up drivers for its race July 4. Among them are Dario Resta, Cliff Durant, Louis Chevrolet and Eddie Hearne. Three races of 40, 60 and 80 miles are planned, with a \$15,000 purse.

ENTRIES FOR UNIONTOWN

Uniontown, Pa., April 28—Before appearing on the Indianapolis track May 31, several of the cars and their drivers will start the season on the track here May 17. Two Roamer special jobs will appear and three Hudsons. Cliff Durant will drive his Chevrolet special. No foreign entries for this event have yet been sanctioned. Among those already scheduled are:

Driver	Car
LeCocq	Roamer
Hitke	Roamer
Pullen	Hudson
Vail	Hudson
Simmons or Hogan	Hudson
Durant	Chevrolet
D'Alene	Duesenberg
Hickey	Stickel

MASSACHUSETTS FIGHTS BILLS

Boston, Mass., April 26—Massachusetts motorists and dealers are up in arms over three bills now being threshed out by the legislature. One bill calls for tripling the fees on motor vehicles, put in by Mayor Peters of Boston. A second bill would require every motorist to be bonded before being allowed on the roads. A similar measure was killed last year and the year before. Under the bill the careful motorist who was bumped by a reckless driver might have his bond attached in a suit by the man at fault, and he would have to get another bond, in which case if that were impossible he would not be allowed on the road. It would mean pyramid bonding by the insurance company. Also if a bonding or insurance company refused a man be-

cause of age or women because they were afraid of the risks, it would put a lot of people off the highways. In other words, the insurance and bonding companies, not the highway commission, would say who should drive the cars.

A third bill seeks to have dealers make a record every day of the cars they take in trade and send the report to the highway commission and also to the local police. The used car dealers would have to hold their cars four days; the new car dealers could sell theirs by getting a permit from the police. But private owners could not sell their cars for four days, nor until they got a waiver from the police.

The truck fee bill has not reached the compromise stage since the deadlock which developed as a result of the hearing.

ROAD BONDS IN TEXAS

Austin, Tex., April 26—The people of this state will vote on issuing \$75,000,000 bonds for the construction of highways this fall. The good roads of El Paso must be duplicated all over the state, say the highway boosters. This county spent more than \$1,000,000 on 40 miles of concrete road and built many miles of other hard-surfaced roads.

CHICAGO PILES UP \$1,000,000

Chicago, April 28—Tuesday noon returns from the Victory Liberty Loan campaign among the local trade showed that about \$1,042,500 had been raised. Total figures are not available, as all the subcommittees have not made their reports, but it is certain that the first week of the drive practically put the trade over the top, as the quota is \$2,300,000. George H. Bird was the first vice-chairman to complete the task of raising his quota among the branch houses, with W. J. Boone and Thomas J. Hay close behind.

The largest subscription so far is that of the Studebaker branch for \$225,000; Ford is next with \$120,000. Other subscriptions include Goodyear with \$60,000; Buick, \$30,000; Overland, \$20,000; Packard, \$75,000; Autocar Sales Co., \$53,500; General Motors, Locomobile, Bird-Sykes and Root & Van Dervoort, each \$10,000; Reo and Pennsylvania Tire, each \$5,000.

VICTORY LOAN GOING BIG

Boston, Mass., April 26—Boston trade secured pledges for about \$500,000 this week for the Victory Liberty Loan. This is 25 per cent of its quota. J. W. Maguire, Pierce-Arrow, is chairman of the committee. The team workers are W. H. Hickey, Goodrich, and Walter Billings; F. A. Hinchcliffe, Jordan, and B. E. Ames, Buick; George B. Kimball, Hudson; L. B. Sanders, Oakland, and E. H. Kidder, U. S. Tire; C. P. Rockwell, Nash; J. J. Harrington, Ford; J. T. Pace, Packard, and B. K. Hart, Dodge Brothers; W. L. Russell, Haynes, and George B. MacBride, Phenix; Frank Coe, accessory dealer.

PHILADELPHIA TRUCK PARADE

Philadelphia, Pa., April 26—Two hundred trucks, representing manufacturers and business houses, made a special ship-by-truck parade through the central part of the city as a demonstration in the campaign to that end. The cars ranged from

fast delivery vehicles of ½-ton capacity, to 7-ton army trucks. The procession was headed by the Navy Yard band. Each of the cars was decorated with Victory Loan posters, slogans, American flags and bunting in the national colors. United States army, navy and marine corps transportation services were represented. Two large trucks of the Firestone Tire & Rubber Co., Akron, O., just in from Washington, participated.

Standard Tractor Ratings?

N. I. V. A. Committee to Co-operate with Government in Fixing Basis

CHICAGO, April 28—The possibility of some definite action toward the establishment of a standard method of rating agricultural tractors is indicated by the appointment this week of a committee of the tractor division of the National Implement & Vehicle Association to take up with the United States Department of Agriculture, the standardization of tractor rating. The committee consists of four officials of old concerns manufacturing general lines of farm machinery, including tractors, with E. J. Gittins, vice-president, J. I. Case T. M. Co., as chairman.

Other members are: J. B. Bartholomew, president Avery Co.; Finley P. Mount, president Advance-Rumely Thresher Co., and G. P. Alexander, vice-president and treasurer Aultman-Taylor Machinery Co. The committee as yet has held no meeting and no plan for procedure has been formulated, but the matter has been taken up with the Department of Agriculture. This department had a representative at the meeting of the tractor division of the N. I. V. A., two weeks ago, and the present committee is the result.

PHILADELPHIA RAISES MARK

Philadelphia, Pa., April 26—The trade to date has raised \$529,500 in the Victory Loan drive, and has announced its intention of exceeding its quota of \$4,000,000 by \$1,000,000 in the two weeks of the campaign. Among the larger subscriptions are the following:

Ford, \$80,000; Thornton-Fuller Co., \$20,000; Overland-Harper Co., \$20,000; White and employees, \$20,750; Bigelow-Willey Co., \$15,000; Herbert Brothers, \$11,000; Locomobile, \$10,000; G. M. C. Truck, \$10,000; Maxwell-Chalmers, \$10,000; B. V. Hoffman, \$10,000; W. B. McCullough, \$10,000; A. I. Swinson, \$10,000; Thomas Martindale, \$10,000.

BRADLEY IS BACK

New York, April 25—L. M. Bradley, former manager of the Motor and Accessory Manufacturers' Association, who was obliged to leave his position about Jan. 1 and go to Daytona, Fla., because of a breakdown following influenza, has returned to New York. He will make his future plans public soon.

TIMKEN BEARINGS ON FORDS

Detroit, April 24—The Ford Motor Co. is now supplying Timken roller bearings

to Ford dealers to replace the ball bearings in the front wheels. The introduction of these bearings came with the detachable wheels, and this bearing is made interchangeable with the old type bearings so that dealers or owners can make the replacement without changing any other parts.

The spiral timing gears incorporated in the design of the engine at the time the electric starting and lighting system was placed on the closed models have been made standard on all the cars. For the time being, straight spur gears can be obtained from dealer and branch stocks for replacement purposes, but as soon as these stocks are exhausted it will be necessary to replace both gears with the new spiral design if one of the gears needs replacement. The spiral gears are coming through the factory regularly.

PLANS FOR TRANSATLANTIC FLIGHT

Washington, April 25—The naval seaplanes NC-1, NC-3 and NC-4 will start on an overseas flight from Rockaway Beach early next month. It has not yet been decided whether the route will be direct from Newfoundland to Ireland or via the Azores. Each plane will carry five men, will be driven by four Liberty engines, with a total of 1600 hp. and will carry enough gasoline to make a stop on a direct flight to Ireland unnecessary under normal atmospheric conditions.

AIR SHOW IN PHILADELPHIA

Philadelphia, Pa., April 28—The first airplane show ever held here is being staged at the Commercial Museum, where the car and truck shows were held. F. G. Coburn, manager of the Naval aircraft factory at League Island, has arranged a display to stimulate Victory Loan purchases. The exhibit includes every type of seaplane used in the Navy, all either made or assembled at the League Island plant. Included are two bombing machines of the C-1 and F-5-L types, a light bombing machine, a training machine, a kite balloon and American and foreign aviation engines.

VEDRINES IS KILLED

Paris, April 21—Jules Vedrines, the French aviator who was the first to make a landing on the roof of a building, was killed instantly to-day when his machine, on its way for a non-stop trip from Paris to Rome, dropped into the Department of Drome at Les Fouillouses, about 225 miles from Paris. The machine, which weighed 5½ tons, was wrecked. It is thought the accident was due to the machine collapsing in the air.

HERE'S DRIVING FOR YOU

Springfield, Tenn., April 28—J. A. Hill, Adairville, Ky., and T. W. Sharp, Springfield, Tenn., arrived here at noon Friday at the wheels of two Grant touring cars, having left from the factory in Cleveland, Ohio, Wednesday morning, making the 650 miles by daylight driving only. The entire trip was made without the least trouble, they report, with a fuel consumption of about 20 m.p.g. They drove from Cleveland to Cincinnati the first day and from Cincinnati to Horse Cave, Ky., by Frankfort and Louisville the second day.

The South Must Build Roads

Poor Roads the Greatest Obstacle to Expansion of Motor Car, Truck and Tractor in Dixie

By B. M. Ikert

Motor Age Editorial Staff



Here is the mile stretch of concrete road in Spalding County, Ga., an example of what is needed

POOR roads are the greatest problem in the South to-day, so far as the car, truck and tractor dealer are concerned. Before we can possibly expect a great expansion of the truck, say, for rural express routes, or the scattering over a wide area of Dixie of the tractor, we must look for a well-defined system of road building on a tremendous scale. Engineering skill must be applied to the roads of the South before there is any permanent improvement. In too many sections the various counties' expenditures for roads have not been on the blueprints or specifications of a first class road engineer.

Georgia as Example

Take Georgia, for example. After many years of costly experiments in making roads, opinions are becoming pretty well crystallized that the much boasted roads are after all but temporary. The foundation for good roads are there, but the superstructure is lacking. The grading is not good in many cases, nor the drainage, hence in a large measure vast expenditures have been wasted. A little rain on the roads going out of Macon or Atlanta creates a tremendous impression on them, and during the rainy season nobody thinks of driving a car between these two cities, a distance which can be covered in a few hours very easily in dry weather. Some of the stretches are composed of a combination clay and sand and do not suffer nearly so quickly from rainfall. But the red dirt roads, which are beautiful in dry weather, become precarious after even a light rain. At frequent intervals along any of these roads you find logs and four-by-fours which must be resorted to for bridging some of the hollows in the road, where the water has perhaps cut a path right across the road, or the mud is so deep that the wheels of the car cannot get a footing.

But agitation for good roads is here, and



Rutty condition of a Southern road after it has rained



Typical dirt road in Georgia, good in dry weather but impossible when it rains much

hardly a day passes but what some county or community announces bonds for road improvement. A splendid example of what can be done is the 1-mile stretch of concrete road in Spalding County, Georgia, on the Dixie highway, between Atlanta and Macon. This work purposely was undertaken during the war, when material was proscribed, transportation bad and labor scarce. It was paid for out of current funds and put into use Christmas Eve, 1918. It was the biggest gift the county ever got, and now they are clamoring for a chance to construct the other 79 miles necessary to complete the Spalding County concrete road system.

Business has gotten ahead of transportation in the South and much money is tied up in cars that are idle, for when used they are destroyed unnecessarily by poor roads. Many business houses in the South have learned to depend on the motor car to a great extent in transporting their traveling men and are doing it. But the practice is stopped in winter, because the repair bills on the cars that fight the roads get exorbitant. Hundreds of farmers who use trucks in certain areas of the South hardly dare venture out on the roads at times without a pair of mules following each truck. This is the state of affairs every winter, in spite of the fact that business in the towns and rural sections has grown to depend on the motor propelled vehicle, which necessarily demands good roads.

Federal Funds Available

Something like \$4,700,000 of Federal funds can be used to supplement county funds and bond issues this year in Georgia, but it is not likely this will be spent, because the great majority of counties in the state are rural counties with insufficient current income to put up dollar for dollar to match the Federal money. In the opin-

ions of many the only solution to the road problem is for the state to relieve the counties of the burden of the construction and maintenance of the main county seat highways, these to be built and paid for by the increased license fees and Federal aid. This would leave the county resources, money, convicts and equipment for the use of the county authorities for building purely county roads. The main highways would not be built at the expense of the local county roads and every taxpayer would be assured of a fair distribution of all the road funds.

It is quite natural to expect poor bridges where poor roads abound, and this is exactly the case in most of the South to-day. While the bridges are all right for a mule team and wagon, they are wholly unsuited to stand much traffic by trucks, while driving a tractor across most of them is out of the question. The truck, owing to its greater speed perhaps could get across before the bridge went, but the tractor would be caught right in the middle. On the recent truck demonstration at Macon, Ga., trouble was experienced with some of the heavily-laden trucks going through the bridges. But with the new order of things in the South and hand-in-hand with the good roads movement will come new bridges. They are being built now for that matter. Just recently a new steel bridge

was opened on the Flint river in Georgia that does away with the old Murry's ferry and incidentally shortens the Dixie highway from Americus, Ga., to Jacksonville, Fla., by about 17 miles. Other sections in Alabama and Mississippi are building new bridges also, and reports from Walthall and Meadville, Miss., and Anniston, Ala., tell of the issuance of bonds for roads in various counties. Good roads meetings are being held in all the Southern states.

It will not be long before associations will be formed in the counties of every Southern state, and they can get squarely behind efforts to float bonds. As yet too few Southern cities have good motor car dealers' organizations. Such bodies can do much good to stir up enthusiasm. Whatever may be said to the contrary, it was the motor car that brought good roads to other sections, and it will be the big influencing factor in the South as it has been in other parts of the country. That is the reason why the dealers must get behind the movement collectively and not only strive for the right kind of legislation but put over truck and tractor demonstrations, so the Southern farmer and merchant will become educated to their importance. Once the merchant and farmer have become sold on automotive equipment, it is a much easier matter to go out and talk good roads to them.

Tank Tackles Pike's Peak Climb

More Than 11 of 18½ Miles Are Conquered Through Snow

DENVER, Col., April 25—Colorado's quarter-million-dollar highway to the summit of Pike's Peak was the scene of a battletank climbing test that attracted wide attention. In spite of deep snow and other difficulties, the tank climbed more than 11 of the 18½ miles of America's highest motor road, reaching an altitude of 11,200 ft., which is about 3000 ft. below the top of the mountain. At that point, near timberline and far above the first banks of deep snow encountered, the machine was disabled by the breaking of a plate in its track. By the time the necessary repairs could be made, the tank was compelled to return to Colorado Springs to start for other Colorado points in the interest of the Victory Liberty Loan.

Although the road up the mountain was blown clear of snow, much of the distance traveled by the tank, yet there were long stretches where the snow was 5 to 10 ft. deep and even more. In some places where the snow was covered with a thick layer of ice, the slippery going called for abundant skill and nerve to guard against a slide over a high precipice. But the substantial width of the road and the handling of the machine prevented any such disaster. The climbing feat was witnessed by hundreds of persons, who cheered the drivers of the tank at every extra hard pull. Some went up the road as far as possible in cars, while many others climbed farther on snowshoes. While the repairs were being made, food was carried to the mechanics by volunteer snowshoe brigades.

The altitude reached is said to be the highest ever gained by a tank in the United States in winter, while new records were made also for length of continuous journey, pulling on grades of 10 per cent and steeper and other feature performances.

The tank was driven in relays by Cor-

poral Howard Brewer, Denver, and by Sergeant A. H. Worrall, Kansas City. Before the start of the climb, Mrs. W. H. R. Stote of Colorado Springs, chairman of the Woman's state Liberty Loan committee, christened the battletank Little Zeb, in honor of Lieutenant Zebulon Pike, who discovered the snow-capped mountain of his name in 1806, when leading an exploring party into the Rocky Mountain region.

FIRESTONE EMPLOYEES MEET

Boston, Mass., April 26—Because of their loyalty in doing the work of the men who were off to the war, the women connected with the New England branch of the Firestone Tire & Rubber Co. here were guests for the first time at the annual spring dinner here this week. The affair followed a two days' conference of traveling salesmen of the New England district, which was called by J. E. Mayle and C. B. Lindeman, the two officials sent here recently to take over the management of the Boston and New England branches. At the dinner there were more than 100 present.

FACTORS IN TRUCK PROFITS

Buffalo, N. Y., April 26—If the average truck were designed and made with the same intelligence and supervision that the average truck receives in service, it would not go together or, if it did, it would not run, said Francis W. Davis, Pierce-Arrow assistant chief engineer, in speaking before the Buffalo section of the Society of Automotive Engineers recently. Truck design has progressed further than truck operation methods, even though loading and unloading time are the vital factors in truck profits.

Mr. Davis has charted methods of determining truck efficiency under varying conditions of haul length and loading times. He also has arranged a system of charts and a method for pre-determining probable profits from any set of transportation conditions. His conclusions and charts composed the paper read before the section.



Part of the spectators who watched the tank climb Pike's Peak

Automotive Repairman a Necessity

Broader Nature of Business Done by Distributers and Dealers Is Reason Why

THE automotive repair man is evolving. He is beginning to take notice of the important place he occupies in the automotive industry and he also is beginning to insist that others recognize that importance likewise. Such a movement as that which resulted recently in the formation of the National Automotive Repair Association at Minneapolis, whether that particular organization survives or not, is significant and shows in which direction the wind is blowing.

The very name selected by the organization is significant. It is "automotive," not "motor car." This means, in the words of David W. Onan of Minneapolis, who has charge of the repair business of Reinhart Brothers, that "the automotive repairman of the future will repair all adaptations of the internal combustion engine as found in motor cars, motor trucks, farm tractors, farm lighting plants, farm power plants and, eventually, flying machines."

Repair Business Growing

The automotive repair business is growing up in every community, both large and small. It really dates its existence as a recognized business in the community to the advent of the motor car, and it has grown up parallel with the motor car business. As motor trucks, tractors, farm lighting plants and other automotive equipment made their appearance the scope of activity of the automotive repairman enlarged, and his importance as a necessary factor in community business organization increased. But only recently did he wake up to his relative standing as a business man. Here and there, it is true, thoroughly equipped and large institutions, devoted entirely to the business of automotive repair, established themselves and won recognition, but it is only now that a consciousness of importance is spreading throughout the ranks of repairmen.

The growing consciousness of relative importance in the automotive industry of the repairman, already typical of the mental attitude of men who have built up substantial repair businesses and soon to be the characteristic attitude of a majority of the automotive repairmen of the country, is voiced by C. O. Russell, Devil's Lake, N. D., when he says:

"The repair business is the main link in the whole automotive business, because what would any other motor car or any other piece of automotive equipment amount to if it were not for the repairman."

As the Russell business is recognized as one of the best equipped and most successful in the Northwest, this statement may be taken as typical of the ideas that are stirring in the brains of repairmen everywhere.

Another highly successful automotive re-

pairman, this time in Minnesota, says pointedly that the reputation of most motor cars depends upon the skill, ability and work of the repairmen. Whether this is giving the repairman too much credit or not is not to the point, which is in reality that the repairman is manifesting a disposition to emerge from his obscurity, to assert himself and to demand recognition commensurate with his importance in the organization of the automotive industry.

The important place the automotive repairman already occupies and the necessity which confronts the trade for adequate equipment to care for the increasing demands for automotive repair is behind such a movement as that started recently by A. W. L. Gilpin, Ford manager at Milwaukee, Wis. Gilpin has inaugurated a series of mechanical clinics to demonstrate to repairmen the time and labor-saving qualities of improved repairshop equipment and to impress upon them the extent to which their business can be made more stable and profitable by the use of such equipment.

Recognition has come also from the Ford Motor Co., Detroit, which now sells Ford accessories to its authorized service stations at a discount so large that in turn the service man may resell to neighboring garage and service men at a price which gives the latter a chance to make a profit and still leave a fair profit to the seller. This is in line with the demand of the repairmen that they be allowed to make something in excess of a mere handling charge on repair parts and accessories, and this demand is based upon the conviction that the repairman is so necessary in the automotive trade that he has a right to more

than he has been given in this direction in the past.

But it is not alone in the motor car field that the automotive repairman is necessary. There now are on the farms of this country at least 150,000 tractors. Probably this number will have been doubled by the close of 1919. In a few years there will be millions where now there are hundreds of thousands. Service on these tractors already has gone beyond the facilities of manufacturers, and even of distributers, to render. Tractor service now is distinctly a dealer problem. This, too, brings it directly into contact with the automotive repairman.

The number of motor trucks in rural communities is increasing by leaps and bounds. George H. Graham of the Pierce-Arrow said recently that the farmers of this country would absorb approximately 2,000,000 motor trucks within the next five years. All these in turn will demand the services of the automotive repairman.

Farm Lighting Prospects

The sales manager of one of the leading concerns manufacturing farm lighting plants is authority for the statement that the distribution of lighting plants now is limited only by production and that, if so many could be produced, hundreds of thousands could be sold every year. This opens up another and certain field for the services of the automotive repairman.

It is such facts as these which have made an impression upon the minds of men who have vision and who can look ahead of what is likely to be. Such a man is David W. Onan of Minneapolis and another is Arthur Sparling of Langdon, N. D. These men see a future in which the skillful and well equipped automotive repairman will be one of the most important, most substantial, most respected of the business men of his respected community. They see the country filled with automotive equipment of all kinds and the working efficiency of such equipment, as well as its very reputation to a large extent, dependent upon the automotive repairman.

The men see too, what a tremendous influence for good the automotive repair branch of the industry can have upon the improvement of design of automotive equipment. How, by working in co-operation with the engineering talent of the country, automotive equipment can be made more accessible and dependable, how the daily, practical contact with the repair work can supplement the more theoretical work of the engineers to the improvement of design, the standardization of product and to many improvements and advantages which now are only hoped for.

In short, the automotive repair business has outgrown its swaddling clothes and is strutting around in long pants, demanding that it be received into full fellowship by the older members of the automotive trades. And this is just what is going to happen.

Muffler Cut-outs

HAVE you a program for the week which marks day by day the steps of getting some necessary work done? A program gets you somewhere. Your program is your ticket for your goal, but you must use your ticket!

THERE are some things which can be done any time; other things must be done at a certain time. A man who values his appearance must shave every morning, and if he would have his mind in equally good trim, he must have eaten simple, wholesome food, been cheerful at business and at home, taken a fair amount of recreation along with the day's work, got to bed in good season, had at least 8 hr. of uninterrupted sleep and then arisen in time to groom as needed for the day, to have a good breakfast and to get to work without hurry.

Trade Year Short in North Dakota

Only Eight Months Are Contained in Motoring Season—Then Into Storage

A SHORT eight months out of twelve is the motor car season in North Dakota. The balance of the year hardly a motor car, outside the few larger towns, is to be seen—they all are in storage. There are no roads anywhere worthy of the name, particularly in the northern portion of the

By Fred M. Loomis

Motor Age Editorial Staff

state, and the man who gets his car out before the latter part of April as a rule is the rare exception. These facts make

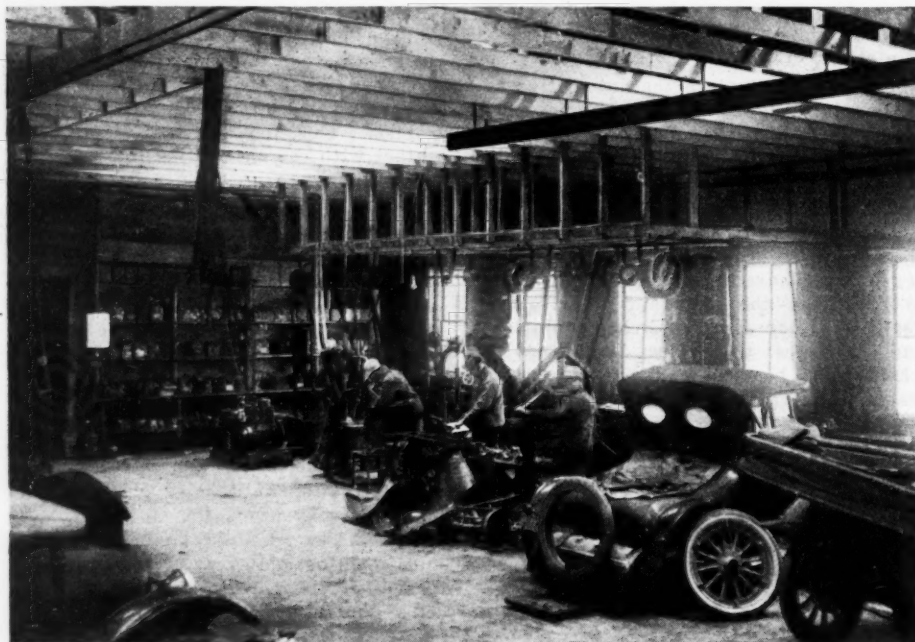
for peculiar conditions in the motor car trade of this section.

North Dakota is an enormous state. Superficially it could comfortably contain an European empire or two. It is an empire—the empire of spring wheat. Who has not heard of the Red River valley and the Bonanza farmers? Well, the Red River valley still is there doing business at the old stand, but the Bonanza farmer is disappearing. The enormous farms, thousands of acres in size, are being cut up into smaller areas and put into the hands of renters. Even so, there still remain 12,662 farms of between 500 and 999 acres and 2416 farms of more than 1000 acres.

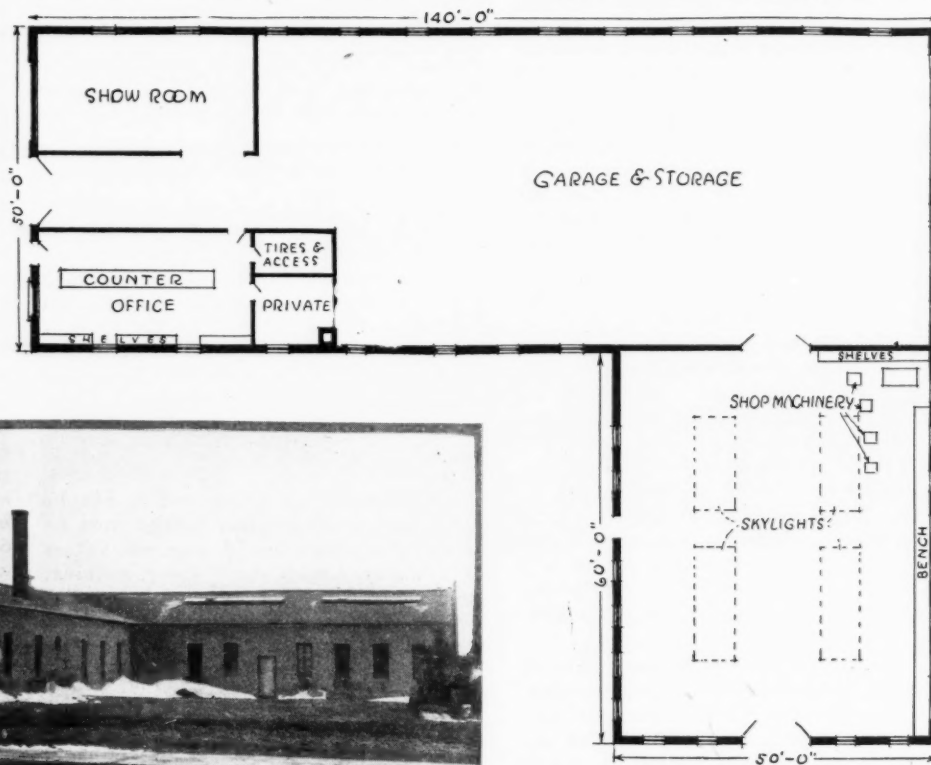
This implies, and is the fact, that the country is sparsely settled and that the towns must be few and small. Almost one may count on the fingers of the two hands the towns of any consequence, as respects size, and the fingers of one hand will suffice to enumerate the centers of population that can assume the dignified appellation of city or which have a block of paved street.

Farmers Are Prosperous

Yet the farmers of North Dakota, or such of them as live east and north of a diagonal line drawn from the southeast corner of the state to the northwest corner, are prosperous. All grow wheat, barley or flax, or some combination of the three, and prices during the last few years for these products have been high. The inevitable result, in these days, of prosperous farm-



These two views and floor plan are from the place of business of McLauchlin & Stranger at Langdon, N. D., a county seat of the Northwest. Above is shown part of the repair shop, while below is an exterior view. The dimensions and arrangement of the garage and shop are shown in the plan. The heating plant is in the basement under the office of the building



ing conditions is the purchase of automotive equipment, and to-day motor cars, tractors and farm lighting plants are being sold throughout this immense area.

But the fact that there are only a few big towns or small cities and that the smaller places are mere hamlets concentrates the motor car business in the larger centers. In these places are garages, storage warehouses, show rooms and service equipment rivaling similar institutions to be found in the older and better settled sections of the country.

In the smaller places, however, there has been little or no development of facilities for the conduct of the motor car trade. The small towns do not boast, as they do in Iowa, Nebraska and Kansas, for instance, of garages and service stations. For the most part the man in the North Dakota small town possesses little or nothing in the way of business equipment. His annual sales at the best run only to a few cars, and these are shipped to him after the selling season opens by the distributor in the larger center. This means that the proportion of direct agents in North Dakota is low, most of the small town dealers being sub-agents.

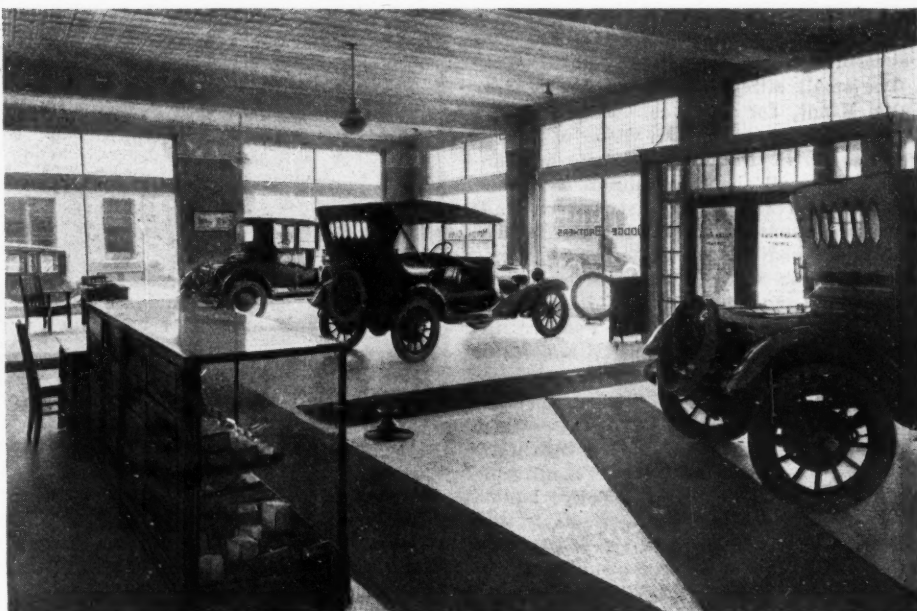
This means also that service equipment in the small towns is inadequate. Here enters still another factor which tends to keep down small town service. This is, as has been stated, a small grain country almost exclusively. In late summer and early fall there is a demand on the farms for every available man to aid in the threshing of the one crop. Men make from \$10 to \$15 a day at this work. The lure of these wages tends to draw the small town garageman, and he commonly shuts up shop and hies himself onto the farm where, during threshing season, he can make more money than he can by keeping his shop open. This throws service, such as there may be need for, into the hands of the garagemen in the larger towns.

Langdon Is Typical

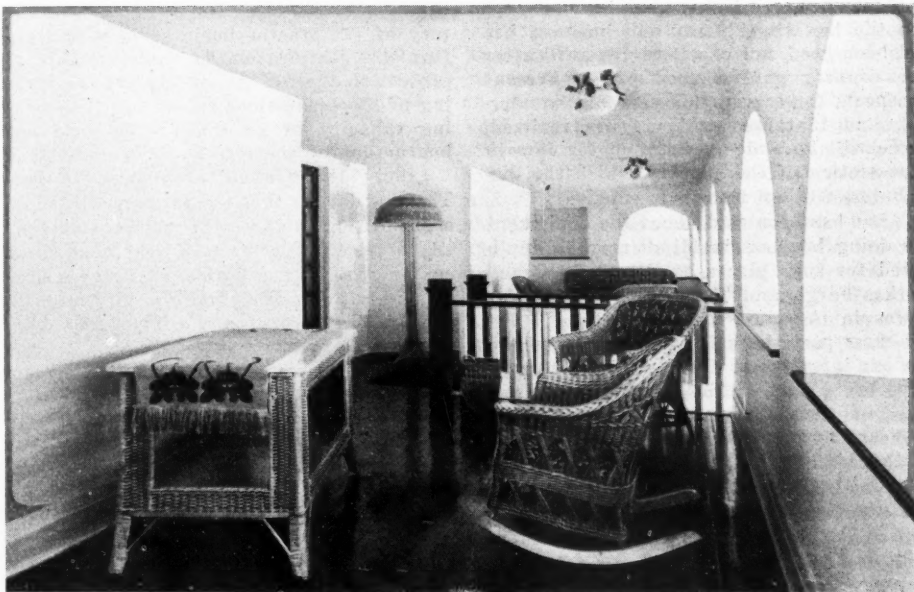
Typical of what a county seat town in this part of the country is Langdon may be cited. Langdon is the county seat of Cavalier County and has about 1400 inhabitants, a very respectable population for so far north. It is only 23 miles from the Canadian border and is situated in a part of the celebrated Red River valley.

Here, too, is located a typical county seat garage and service station. There is shown herewith a ground plan, an outside view and a shop view of the McLauchlin & Stranger garage at Langdon. The concern sells Buick and Chevrolet cars and accessories and maintains a well equipped repairshop. Last year the company sold about seventy-five cars.

Considering the size of the town and the volume of sales, the dimensions of the garage appear out of proportion. This merely is indicative of another peculiarity of the motor car business in this section. It is the exceptional farmer who has on his farm any place in which to house his motor car. In December, the customary time for laying up cars here, the farmer drives his to the nearest garage town and stores it for the winter. Thus, in these larger towns, the garages must be commodious, because they must house the neighborhood cars for three or four months



Sales and showroom of the Fuller Motor Co., Minot, N. D.



Restroom for women at the garage of the Pence Auto Co.



This is the interior of the Pence Auto Co. garage at Minot, N. D.

out of the twelve. At the present time the cars are stored two deep in the Mc-Lauchlin & Stranger garage.

The small cities have some fine places. Take Minot, for instance. Minot is the distributive center for the whole of northwestern North Dakota and eastern Montana. Here all the cars sold in that section are represented by distributors, and some of these concerns have places which would be a credit to any eastern city. Notable among the Minot places are the establishments of the Fuller Motor Co., distributor of Dodge Brothers cars; the Pence Auto Co., handling the Buick; the Minot Auto Co., selling the Overland; the Moore Motor Co., with the Ford, and others which equally deserve mention.

All these have large and substantial buildings, extensive service equipment and carry large stocks. Nearly all have handsome showrooms, this being particularly the case with Fuller and Pence.

Both these buildings are comparatively new, and both were designed for the motor car business. The illustrations will give some idea of how elaborately some of these far Northwestern concerns are equipped to do business.

Western North Dakota has had no crops for the last three years and business has not been good, nor can it revive until after the country gets a good crop. Present prospects for a crop this year are wonderful, and if these prospects are realized, there will be a demand for motor cars in that section of the country which the distributors will not be able to supply.

What has been said about the equipment for doing business in Minot may be duplicated for such places as Bismarck, Grand Forks, Fargo and to a lesser extent for towns in the class of Devil's Lake. For the most part the buildings which the motor car interests of the Northwest occupy have been built within the last few years, some of them during the last two, hence they are new and up-to-date. They speak of the confidence the motor car men here have in the future of the country and indicate their readiness to take every advantage of the opportunities presented to them to do business.

OVERSELLING IS DANGEROUS

Chicago, April 26—Overselling tractors produced its natural result in the law passed by the last assembly of North Dakota which gives the purchaser of a tractor a "reasonable time" in which to determine whether the machine is fitted to the work for which it was purchased and allows the buyer to rescind his order for the machine and demand his money back in case it does not come up to representations as follows:

Section 1—Reasonable time to discover defects. Any person, firm or corporation purchasing any gas or oil-burning tractor, gas or steam engine, harvesting or threshing machinery for their own use shall have a reasonable time after delivery for the inspection and testing of the same, and if it does not prove to be reasonably fit for the purpose for which it was purchased the purchaser may rescind the sale by giving notice within a reasonable time after delivery to the parties from whom any such machinery was purchased, or the agent who negotiated the sale or made delivery of such personal property or his successor, and placing same at the disposal of the seller.

Section 2—Provisions contrary to the preceding section void. Any provisions in any written order or contract of sale, or other contract which is contrary to any of the provisions



Typical storage garage in the Northwest. This is at Minot, N. D.

sions of this act are hereby declared to be against public policy and void.

Of course, this is non-partisan legislation, hence radical. Probably such a law hardly could have been passed in any other state than North Dakota. Nevertheless, the history of the tractor business in that state furnishes justification for some measure of protection against overselling and the making of representations respecting the working capacity of machines which are not borne out by the results.

Likely the present law goes too far. There is danger that the farmers will show a disposition to abuse the privilege extended to them. Tractor men fear that state courts, with farmer juries, will give a firm or corporation selling tractors the worst of the deal in case of any controversy over warranty or performance.

However that may be, and no one can say until after a test case or two have been carried through the courts, the present aspect of the situation is that a salutary check will have been put on overselling. With this law on the statute books of the state the tractor manufacturer, his traveling representative and the dealer who sells to the farmer, all will be mighty careful not to overestimate the capacity of a tractor when selling it.

So far as this goes the law will have a good effect, because it is notoriously the fact that tractors have been oversold in many instances. But it remains to be seen whether the effects of the law will stop here or whether they will constitute an abuse of privilege. If the latter, it is certain there is trouble ahead in the tractor trade in North Dakota.

DRIVEAWAYERS, TAKE NOTICE

Oil City, Pa., April 25—Here's how John L. Bromley drove two cars from Cleveland, Ohio, at the same time. He rigged up a semi-rigid coupling device which clamped on each side of the rear axle of the front car and fastened in a pivot at the front of the rear car. From this pivot it went on back to the point where the steering rod connected and, by making a little shift here, he had the car so fixed that the motion of the machine in the lead automatically steered the one behind, just as if a driver were sitting in it.

Next, he ran two wires from the rear car's carburetor to the dash of the one he was driving and thus had control of the power, being in position to increase or decrease the speed of the car as easily as that of the one he was driving himself. Both cars were under their own power throughout the trip and Mr. Bromley says that in the start he out-distanced some drivers who were at the wheels of single machines. With good roads, Mr. Bromley says, he could make the trip from Cleveland to Oil City in 8 to 10 hr.

FORD STREETCAR UNDER WAY

Detroit, April 25—Henry Ford's proposed internal combustion engine streetcar will operate on a track the same as an ordinary streetcar. It will not be equipped with pneumatic tires, as generally supposed, but with steel flange wheels and will have a carrying capacity equally as great as the present trolley. E. G. Liebold, secretary to Mr. Ford, states that if Dearborn township officials grant Henry Ford's application for a blanket franchise to operate a line in that township, the internal combustion streetcar, suggested as Detroit's solution for traction trouble, will be given a practical working demonstration.

Mr. Liebold said the franchise was sought both as a means to haul Ford workers between Dearborn and Oakwood, serving as a speedy method of transportation for the workers in the tractor plant and in the huge blast furnaces, and to prove the worth of the internal combustion gasoline-driven streetcar accepted by Mr. Ford as the traction unit of the future.

If the franchise is granted work on the line will start within six months and cars will be in operation within eighteen months. Three cars of the proposed internal combustion type are now under construction at the Fordson tractor plant at Dearborn.

STEWART-WARNER DOUBLES

Chicago, April 25—Net profits of the Stewart-Warner Corp. for the first quarter of 1919, ended March 31, were \$549,653, against \$227,582 for the same period of 1918.

Lessons of Efficiency Are Taught by Bus Company's Garage

MOTOR AGE readers are not generally interested in service stations equipped and maintained for the exclusive use of large bus companies. However, there are some of these from which the comparatively small service stations might learn many methods of efficiency, and the new service station of the Fifth Avenue Coach Co. of New York is one of them.

It is not exaggerating to state that the high-water mark of efficiency in garage design has been reached in this building, at 132d street off Riverside drive. Ten distinctive features, solving the problems of time, space, energy and money, place the

structure in the foremost rank of modern garage practice.

A double grading of 2 per cent from north to south and 6 per cent from east to west has offered the designers a peculiar advantage in planning a system of entrances made flush with each of three floors. Such entrances obviate the need for elevators. Two hundred buses leave the building between the hours of 6 and 8 each morning, allowing an average of half a minute for each departure. With elevators it would require 6 min. to lower one bus and return for another. The time-saving feature is obvious.

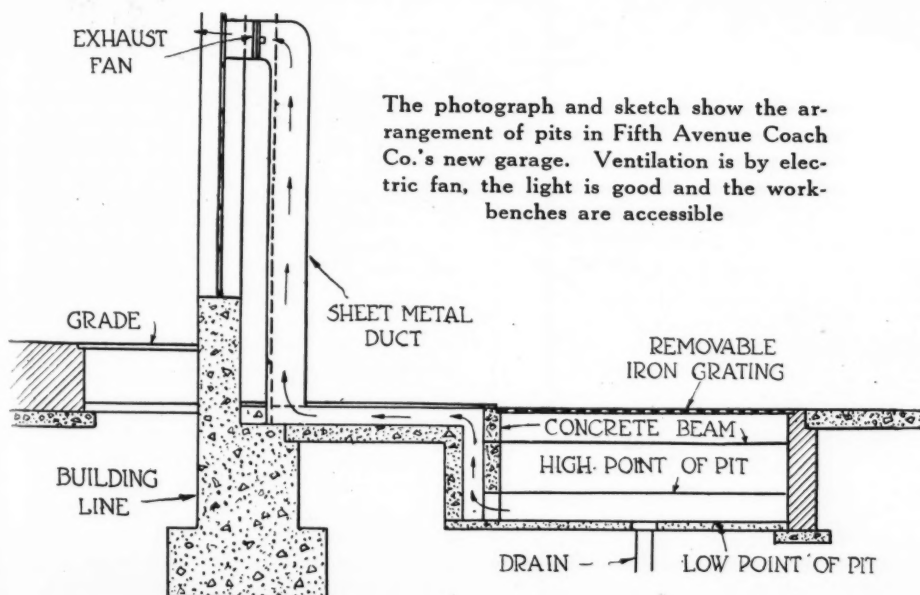
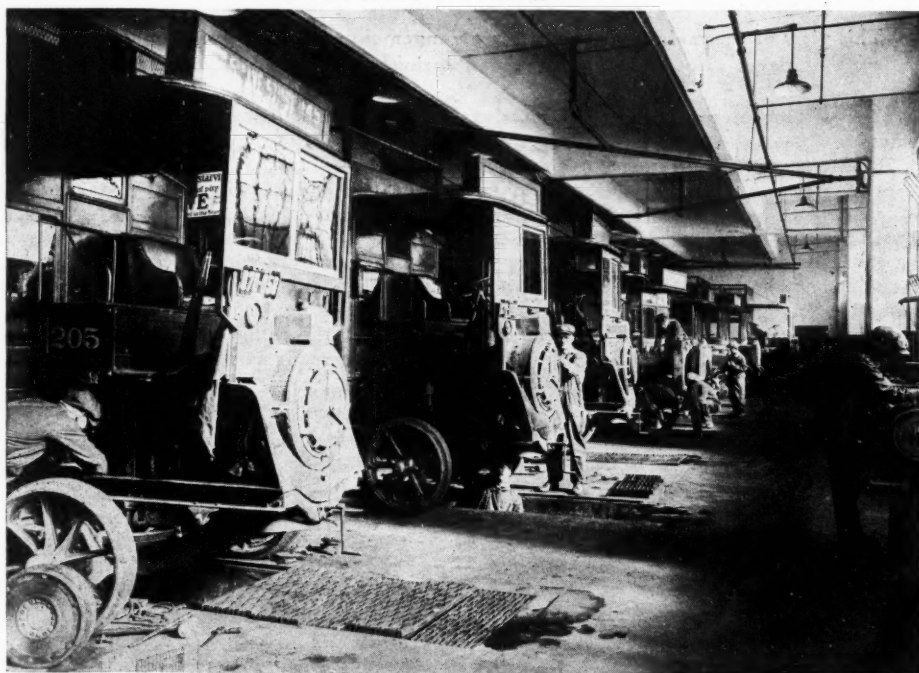
Occupying an area of 82,000 sq. ft., or approximately 2 acres, the garage commands an extensive floor space. The plot is rectangular, 200 by 400 ft. This is used for the main building, with one extra lot at the southeast corner devoted to an administration and welfare building. In designing the building several points had to be considered, such as the storage capacity, accessibility to buses, ease of handling in and out of the building, and flexibility of storage arrangements. The final plans provide for a five-story building which will take care of any expansion of operations.

The supporting columns make up for the considerable space they occupy by housing hot and cold water and gasoline pipes. At each entrance two columns supply gasoline to incoming buses at the rate of 25 gal. a minute. Six electric pumps, automatically operated from the gasoline draw-off points, make possible this record speed of filling. The gasoline supply is in two batteries of six 8000-gal. tanks below the cellar and the first floor. These tanks are filled conveniently through pipes leading from the sidewalk outside. The accumulation of sediment in these has been found troublesome, and to prevent unnecessary impediment to the flow they have been tipped 2 to 4 deg., thus forcing all foreign matter to the lower end of the tank. The gasoline system is adequately lettered and marked to facilitate reference in case of repair work. Every column has its plan number painted on four sides of it, and every lamp has a number indicating the columns at which its control switch is located. The lubricating oil is contained in one 2000- and three 500-gal. tanks, distributed by eight plunger hand pumps. Space has been set aside at the entrance on the main floor for the storage of the oil. One 550-gal. tank is used for kerosene. The 2000-gal. tank is used for lubricating oil, the others for gear and light weight oil.

Gasoline Indicator Boards

Gasoline indicator boards have been placed conveniently in each of the two floors now in use. These show at all times the amount of gasoline on hand in the six tanks.

Exceptional arrangements have been made for the circulation of water. Nearly all the columns have hot and cold water facilities, and a bus may be washed practically where it is standing. Other improvements under this head include a sprinkler system, overhead washing devices and a plumbing system remarkable for the fact that every panel of the building is drained, several pipes passing through concrete beams to save headroom. The sprinkler system is unique in that all horizontal pipes are either underground or between the bottom of the slab and the bottom of the beams. This method involved very careful placing of the sleeves and inserts for this work but saved about 2 ft. of headroom in each story.



The photograph and sketch show the arrangement of pits in Fifth Avenue Coach Co.'s new garage. Ventilation is by electric fan, the light is good and the workbenches are accessible

The sprinkler system is supplied by four connections to the street water mains and by an underground 100,000-gal. reservoir. A 1000-gal. a minute electric fire pump forces the water from this reservoir to the underground sprinkler supply lines. This reservoir is roofed over and forms a part of the first floor. Distributed near each of the entrances are overhead washing devices with hose connections extending to the floor. These are convenient for washing the upper decks and windows, as well as for filling the radiators when the buses come in at night. Each system of piping is painted in a distinctive color; the sprinkler in red, steam in yellow and plumbing in green, with any exposed electric work in black. Heat is supplied by a low-pressure Warren-Webster system with Nash vacuum electric return pumps. Steam is provided by two 150-hp. Fitzgibbons boilers connected to a 155-ft. brick stack.

Storage of Fuel

Space has been set aside for the storage of 1600 tons of coal. To save time in the discharge of coal from the trucks it is so arranged that the conveyance may drive right into the garage and discharge its cargo through manholes directly into the bunker in the easterly side of the cellar.

The accompanying illustrations show the excellent lighting facilities. Ample window area obviates the use of but few lights during the day, even in the basement. The ceiling and walls are white-washed, and in the center of each 1100 sq. ft. panel is a lighting fixture. These are designed for 18-in. enameled iron shades and 350-watt lamps. There is an



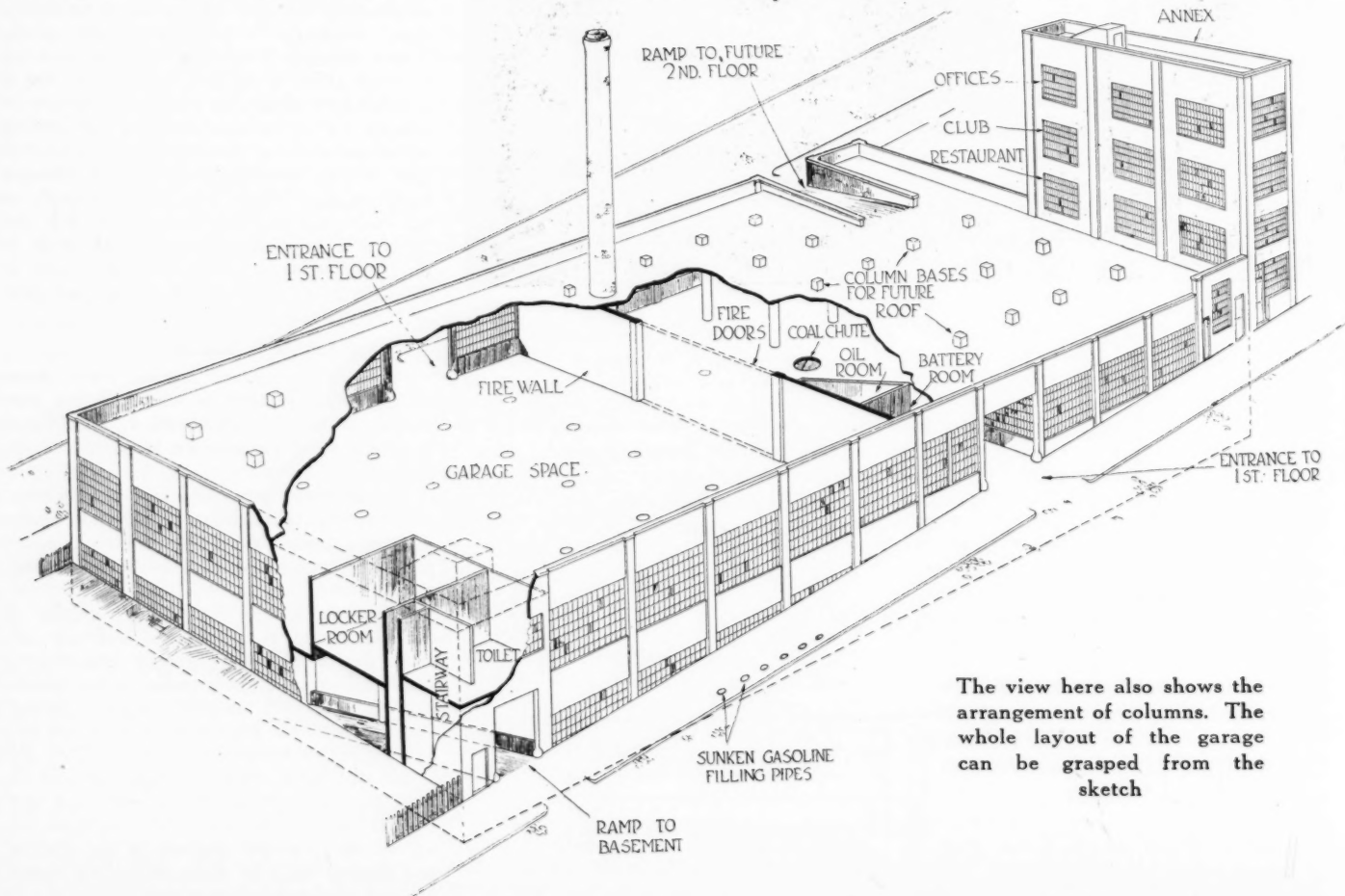
This view of the main floor shows the arrangement of columns and ample storage space. Note how the overhead sprinkler system is provided for

extension plug device at every interior column.

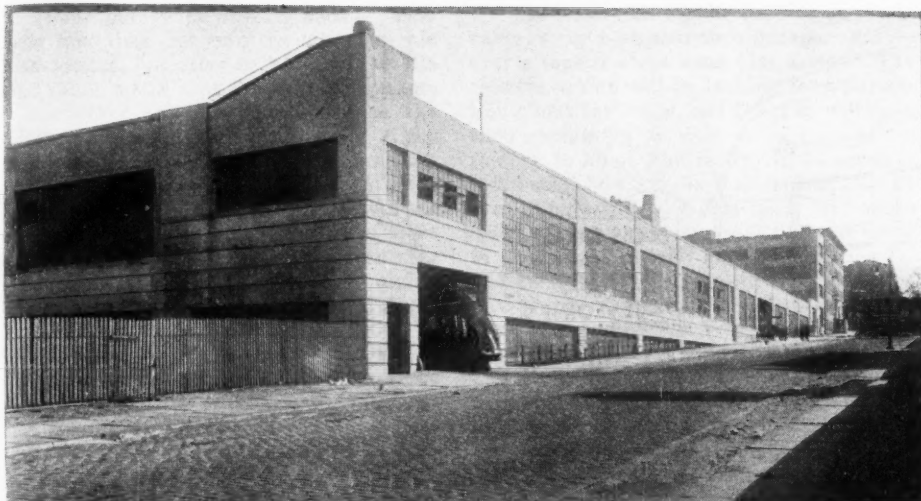
Two battery charging rooms, one on each floor, take care of the complete handling of this phase of the company's system. Facilities are such that 150 batteries can be charged at one time. Elevating trucks, large enough to carry seven batteries and just high enough to roll under the battery container of the bus, have solved the lost motion problem in battery lifting. Two

trucks with their load of fourteen batteries are put on the city line direct, with no resistance.

At the end of the day the trucks are placed conveniently near the entrances, and as each bus comes in it is a matter of but a minute for the replacing of the old battery for the new. At the same time the gasoline tanks are filled, new oil supplied and the radiators replenished. Thus the bus is ready in the morning to go out.



The view here also shows the arrangement of columns. The whole layout of the garage can be grasped from the sketch



No elevators are used in this garage. All entrances are flush with each floor and ramps lead to basement and second floor

All these efficiency methods have resulted in an organization of clocklike movement. The success of each department is dependent upon the smooth working of the others. The repair department, for instance, is dependent upon the lighting facilities, tool layout, pit arrangements, distribution of work, stockroom and repair benches. One hundred trucks are taken care of by the section in the basement, and 200 can be housed in the section on the main floor.

To give the repair crew the best of lighting facilities the work benches have been installed along the windows on both floors. Pits have been placed right in back of the benches. The tools are placed in systematic order in racks on the walls, and the stockroom is near by. All parts are kept in steel bins, and to save time all main units have been photographed. These photographs are placed at the ends of each bin, accompanied by the part numbers of each respective unit.

Twenty-eight Inspection Pits

There are eleven inspection pits in the basement and seventeen on the main floor. The pits are open underneath all the way through. A constant circulation of air is set up in the pits by an electric fan which is placed at one end.

Straightening-out shafts or any other heat-treating processes are taken care of by a forge shop placed in the basement.

It has been figured that over 21,000 miles are covered each day by all of the buses in operation, or about 100 miles a day a bus. As no spare buses are kept, the importance of an efficient equipment is manifest, as well as the elimination of road repair work which cuts down efficiency. To carry out the last feature the company has perfected its equipment so it can concentrate repairs at a given point, that of 1400 miles. The old buses are expected to run 1400 miles before any repairs are made on them. The new buses are covering 2000 miles without repairs. This means grease cups, tires, electric lights, etc., must not be touched before these distances are covered. By this method, should some weak point develop with time, the engineers would be called upon to investigate so as to bring that specific unit up to requirements. The

company figures that its success is due primarily to the design of the vehicles and that the organization is secondary.

U. M. SERVICE ON RADIATOR

Detroit, April 25—The United Motors Service Co., Inc., will take over all service work in connection with the Harrison Radiator Co. Harrison, while a member of the United Motors organization for some time, has not been included in the United Motors Service work. Increase sales and expansion of the radiator business has been so great in the last year a complete service system now will be developed and operated in connection with the service organization handling other United Motor lines. E. W. Broehm, an expert in service

work, has been placed in charge and will work out the details of the proposed service consolidation. The United Motors operates fourteen service branches in all sections of the country.

NO USED CAR SHOW

Milwaukee, Wis., April 25—Because of the brisk demand for used cars, the Milwaukee Automobile Dealers, Inc., has decided not to hold its annual used car show this spring. Nearly every dealer in Milwaukee has found customers for all his used cars, and many of them say they could sell a lot more if they had them. The sale of new cars is not only of remarkable proportions but increasing. The demand is far greater than the supply, which is the main reason why there are so few used cars available and such a good demand for them.

ARMY TO HAVE 1050 TANKS

Washington, April 25—Preliminary plans for the Army provide for a minimum of 1050 tanks, 330 to be of a heavy and 720 of a light type. Arrangements provide for forty-five fighting tanks to a battalion with twenty-four in reserve and forty-five to a light battalion with twenty-seven in reserve. The tanks already manufactured and used—the 2-ton and the 35-ton—will be continued as the light and heavy types, the 35-ton being equipped with Liberty engines, carrying a 37 mm. cannon on each.

EATON LEAVES MOON

St. Louis, Mo., April 25—W. R. Eaton, formerly district sales manager of the Moon Motor Car Co., has resigned to become president of the Aconite Tire & Rubber Co., St. Louis.

Danger!

Auto "Flu" Is Raging—Thousands of Cases Reported Daily

Indications

Car gets pale (needs repainting and renickeling).
Motor sneezes and coughs, its lungs get bad and clogs up (poor compression and full of germs) (carbon).
Doesn't digest its food (gas and oil) (poor piston rings, worn pistons, scored cylinders, out of round, etc).
Poor heart action (carburetor and ignition troubles).
High fever (motor heats up).
Is very weak and can't work hard, is always laying off, for from one hour to several days and is confined to its bed often (in for small repairs frequently).

The Cure

Bring the affected to some real doctors of this disease, where their experience has ran back to the days of the debut of the automobile as a practical necessity and who have made a life's study of the above work needed.

Our work is moderate priced and absolutely guaranteed.
Expert advice and estimates furnished free.
Fords painted, \$25.00.

Englewood's Largest Garage and Repair Station

Come in and see for yourself

AUTO SALES AND GARAGE CO.

5951-5959 South Halsted Street

Telephone Englewood 563

H. C. Simmona, President

How an enterprising concern makes use of a common situation to attract trade



The appearance of your place of business must be as good as the picture conjured in his mind by reading signs

To Get Transient Trade You Must Go After It—Bill Strong

"BILL, how is it you get so much tourist business? I figure that the profit on this trade is just so much velvet, but somehow I don't get very much of it." The speaker was Bob Hubbel, a garageman in a neighboring town and a friend of Bill Strong's.

"The main thing," responded Bill, "the main thing in building up a transient trade is to go after it. All other things are secondary to that, and the fact that the matter has you thinking about it is very encouraging. There are many that don't even do that.

To Get Tourist to Stop

"Let's consider this proposition right from the beginning. First, we've got to contrive to get Mr. Tourist to stop here instead of some place else along the road, and having done that, we want to treat him so well he'll keep on stopping whenever he is in this vicinity and perhaps tell his friends as well. Of course, when I speak of a tourist I really mean all motorists not located in Liveburg. I am thinking just as much about getting business from the motorist who lives in the next town up the highway as I am about the man who lives in the next state.

"The first thing is a good location. Luck-

ily we both have that. My garage is not only on main street but it also happens to be a transcontinental highway as well. Your garage also is well placed at the intersection of two popular state roads. The foreign traffic past our doors is very heavy in both cases. So the business is there if we can only halt it. Perhaps you have noticed how I've done that. I have used signs liberally on every roadway within 20 miles of Liveburg. There is a lot of thought in these signs. They are uniform in color and general appearance and they all have my trademark, and they all feature the name and location of my garage strongly, and as is usual, I have given the correct mileage from the location of the sign to my place of business. But at this point the uniformity ceases. Each sign carries a slightly different message, so that the total effect as the motorist passes sign after sign is to sell him on my place of business.

"Each message is brief, is in large letters and is easily read. I don't begin to remember them all but one reads, 'Prompt service minimizes delays en route. Stop at Bill Strong's for gasoline.' Another reads, 'You can buy anything you want. We carry a full stock of accessories.' This

sign is to allay the doubts of the man who wonders whether we have what he wants or not—so many places haven't, you know. Another sign states, 'Our shop is our especial pride. The best of workmanship in the shortest time.' There are other signs calling attention to our complete tire stock, our vulcanizing facilities, the size of our garage, the conveniences we offer to tourists, toilets and restrooms, the policy back of the garage and so on. In short, after a motorist has seen a half dozen or so of these signs he is almost certain to stop at my garage if he desires anything at all in the vicinity of Liveburg.

Location Requires Certain Sign

"In your case you also need another type of sign. Let me explain. You are located outside of your town at the intersection of two main roads. Motorists come tearing by your place at such a rate that even though they may want something and even though they may be ready to stop at your garage for whatever they want, they may have come upon it so quickly that they have passed it before they can stop, and once this happens they will continue to the next one rather than turn back. The remedy is to erect signs about 300 ft. from the intersection, informing the motorist

that your garage is 300 ft. ahead. This gives him time not only to make up his mind to stop, but after he has made up his mind there is still time to stop. My garage, on the other hand, being located in the center of town, does not require these signs—traffic prevents a car passing my place very rapidly.

"To sum up the sign proposition: As the motorist passes sign after sign he is more and more sold on the idea of patronizing my garage so that by the time he sights it he is usually ready to stop, that is, if he needs anything.

"These signs, by the way, should not be located carelessly. Thought should be given to the matter. For one thing, the sign should be located at a point where road conditions permit the driver to look at the sign without sacrifice or effort. Another thing, some locations are more prominent than others, and so this factor must be given consideration. How large to build your signs depends on the importance of the tourist traffic, the size of your pocket-book and a lot of other things. Perhaps in your case signs 2 by 3 ft. would be sufficient. I am using this size on the lesser highways, but on the main highway I believe that a 4 by 6-ft. sign pays and so have adopted them.

Garage Signs in Lobby

"Another excellent method of advertising is to induce hotels in neighboring cities to hang up a special garage sign in the lobby. These should be neat and attractively made.

"Still another good method is to print a road folder of that section of the country and distribute it to all the hotels within a large radius of your town. The map should be accurate and easily read. It should be in folder form and should fit readily into the pocket. The back can carry advertising matter pertaining to your garage.

WHEAT TRACTOR ABROAD

Buffalo, N. Y., April 25—Agencies of the Hession Tiller & Tractor Corp. have opened in Marseilles, France; Brazil, Argentine, and Uruguay, South America. The concern is planning an active foreign trade campaign.

CONTEST FOR TOURING EQUIPMENT

Paris, April 3—By mail—June 9 the Touring Club of France will hold a competition for the equipment of cars for extensive touring and camping. This competition is a part of the big program drawn up by the club in celebration of its twenty-fifth anniversary. It is felt that very few cars are so designed that accessories such as tires, rims, tools, batteries, etc., can be carried conveniently. The object of the competition is not only to find the best ways of lodging these essential accessories but also to reveal the best methods of carrying baggage and touring equipment. Light two-wheel trailers suitable for placing behind a passenger car will be admitted.

NEW TRUCKS FOR PACIFIC

Detroit, April 25—J. Neil Patterson, Los Angeles, Cal., is in Detroit completing plans for a new company to be organized to manufacture trucks and trailers at Los

"The maps also can be used to good advantage right at your own garage. Whenever a tourist stops hand him a map. The chances are he will be looking for information about the roads, and the map will save time explaining as well as be more satisfactory to him. The really important consideration, however, is that he has carried something away with him with your name on it. Use of this map will fix your name in his mind. He will be sure to remember you next time he is in the vicinity and having your name at the tip of his tongue he will be more than ready to recommend your place to any motorist he may meet."

"Don't disappoint Mr. Tourist. The appearance of your place of business must be as good as the picture conjured in his mind by reading your signs. If it isn't, he will likely drive by, and then your effort will have been wasted. Be sure every detail about the garage is neat, clean and attractive. Be particularly careful about the washing of the windows and the accessory displays therein.

"Once you have induced Mr. Tourist to stop, you should not let him get away without selling him everything he requires. Make a practice of running your eye over his car, and ask him if he does not need this or that. Be sure your suggestion is apropos, however. If he has had any tinkering to do on the road, mention tools, a pair of overalls or jumpers and a pair of working gloves to prevent the hands from being soiled. If the road he has just traveled is dusty, suggest a duster and goggles. For overheating, a radiator thermometer, and if the country is sparsely settled, a collapsible water pail. For the man who has trouble finding his way, a guide book. For the man held up by a puncture, a tire repair outfit, or muddy roads, chains. For the man who drives at night, a spotlight.

"A careful inspection of the car and

casual conversation should reveal whether there is any equipment he particularly needs.

"If you can obtain his name and address, it is worth while to write him a letter, thanking him for his patronage, hoping that he was entirely pleased with his treatment and expressing a desire to serve him again. Such up-to-date-ness and such thoughtfulness are so unusual that such a letter cannot fail to win keen appreciation.

"It goes without saying that the tourist should not be held up at any point. He should be greeted promptly and cordially, and his wants should be filled in the shortest space of time so he can be on his way with as little delay as possible. The tourist particularly appreciates promptness.

Stimulates Local Trade

"And I'd also like to add that the same methods which bring tourist business also stimulate local trade. I know in my own case that the signs I have erected are one of the best advertising mediums for reaching the motorists of Liveburg you can imagine. It's only natural. The people from this town are on the various roads in this vicinity almost daily, and every time they pass a sign the name of my garage and what it stands for are impressed a little more deeply on their minds.

"For obtaining night business the most important thing is a good garage sign. One that is attractive, yes, impressive, and at the same time one which is sufficiently large and well illuminated that it can be seen quite a long distance away. The farther the better. Such a sign is of particular advantage to the tourist who has straggled into the town. Perhaps he has located a hotel for the night and perhaps he hasn't, but in either case he is anxious to put up his car for the night and the sight of a garage sign spells welcome to him."

Angeles. He was former president of the Los Angeles Trailer Co. and is now vice-president. The company will bring out a truck to be known as the Patterson and made up of standard parts. It will have many new features. These pertain to cooling, oiling and gear ratios and to general chassis hook-up to meet western conditions. Eastern as well as western capital is interested in the new company. Robert Fry of Detroit, until recently with the engineering department of the motor transport division of the Army, is associated with Mr. Patterson as chief engineer.

TRUCKS FOR FARM PRODUCE

Philadelphia, Pa., April 25—Farmers' meetings are being held in the Pennsylvania district, including portions of Delaware, Maryland and New Jersey, on the farm-to-table plan of the Postoffice Department. The farmers will be asked to furnish a list of products that will be available during the summer and, as near as possible, the quantities. A list will be compiled and supplied to consumers. In this way, and aided by motor trucks, the Government hopes to adjust the difficult problem of distribution for the betterment of conditions for both farmer and consumer. There is some opposition from commission men.

HAYNES TO INCREASE CAPACITY

Kokomo, Ind., April 25—Extensive additions to the plant of the Haynes Automobile Co. are to begin at once, and this fall the capacity of the factory is expected to reach about fifty cars a day. The company has increased its capital from \$3,500,000 to \$5,000,000.

FRANCE PLANS TRACTOR TRIALS

Paris, April 3—By mail—Farm tractor trials will be held in Lorraine about the end of May and also in Alsace, near Strasbourg, at the end of September. The Lorraine competition is scheduled for the neighborhood of Metz, where the earth is of a heavy nature. The Strasbourg trials will take place in light Alsatian soil. These competitions are open to Allied and neutral nations.

MAGNER TO REPRESENT N. A. D. A.

St. Louis Mo., April 25—Robert L. Magner, Seattle, Wash., has been named one of the National Automobile Dealers' Association's traveling field secretaries. He was formerly a dealer in Seattle and president of the Seattle Automobile Dealers' Association. His territory will be the Pacific Northwest with headquarters at 415 Railway Exchange building.

Garage Planning

Service Station Arrangements

No. 41

Q—Show plan for a garage of 100 by 140 ft. We should like to have two or three different sketches, suitable for a lot of this size, which is located on the corner of First and Walnut streets. Our frontage is on First street, which is on the Yellowstone highway. This front is 100 ft., while the Walnut street frontage is 140 ft. While Walnut street is not greatly traveled at this time of year, it will be paved some time during the coming summer and after that will be traveled considerably.

From our viewpoint we believe that it would be to our advantage to have the salesroom right on the corner of Walnut and First, and it should be about 50 ft. fronting on First and about 35 ft. on Walnut. It might be better to have 45 ft. on Walnut, giving room for offices, accessories, etc., in the main showroom, which will be divided by counters, showcases, etc. We must have a private office, manager's office and a main office. The cashier is to be located in the main office, also the bookkeeping department, which is handled at the present time by one bookkeeper and an assistant. We would like to have a battery service department to front on First street. We must also have a women's and men's restroom.

We desire the driveways good and wide, possibly 14 or 16 ft. We will want a good large washrack and a small light room for simonizing cars. This room is to be just large enough to hold two or three cars. In the rear will be the shop, which should be 60 or 70 ft. long and possibly 30 or 40 ft. wide. We would like to have all the room possible for storage but do not want to crowd the rest of the departments. We want a building to cost from \$18,000 to \$20,000.

Show plan of the cheapest truss to span 50 ft. We understand there is an ordinance in this city requiring a pier every 25 ft. At the present time we believe we will build the garage out of tile.—H. & B. Motor Co., Yakima, Wash.

We have tried to lay out your wants to the best advantage of space and location. We also refer you back to No. 26 as being a very good plan which might meet your requirements with a few changes.

Oil and battery service is at the side of the main entrance, but should not interfere with traffic, as your entrance is wide enough for two cars to pass. The gasoline

MOTOR AGE is receiving many inquiries for garage plans which do not give sufficient information to permit an intelligent reply. There are certain things which should be known to lay out the proper plan for a garage, and inquiries are urged in asking for such plans to be sure to include the following information:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

pump should be at the curb, in front of accessory store. Then it would be in view of the accessory salesman and also handy for battery man when accessory man was busy.

It has seemed to work out best to make an outside entrance to the washrack to use an otherwise rather inaccessible space behind stored cars. The simonizing room could occupy a space at A, lighted by a skylight, or the space now taken by the

tool and stockroom adjoining the wash rack. This room might also be at B.

What is known as a lattice truss is probably the cheapest form and is used to a great extent in garage building. These may be supported on piers any practical distance apart, depending on the length of the timbers obtainable for purlines or ties between the trusses. If you intend supporting your rafters directly on the trusses they could not reasonably be more than 25 ft. apart, if you use purlines resting on the trusses and supporting the rafters, then you can place them farther apart. But here again you will need a different type of truss because all your load will be at a few points and much greater. Do not try to build trusses without consulting an engineer or architect, as every problem calls for a special solution. Wind pressures sometimes alter the whole scheme of a truss but have to be figured in.

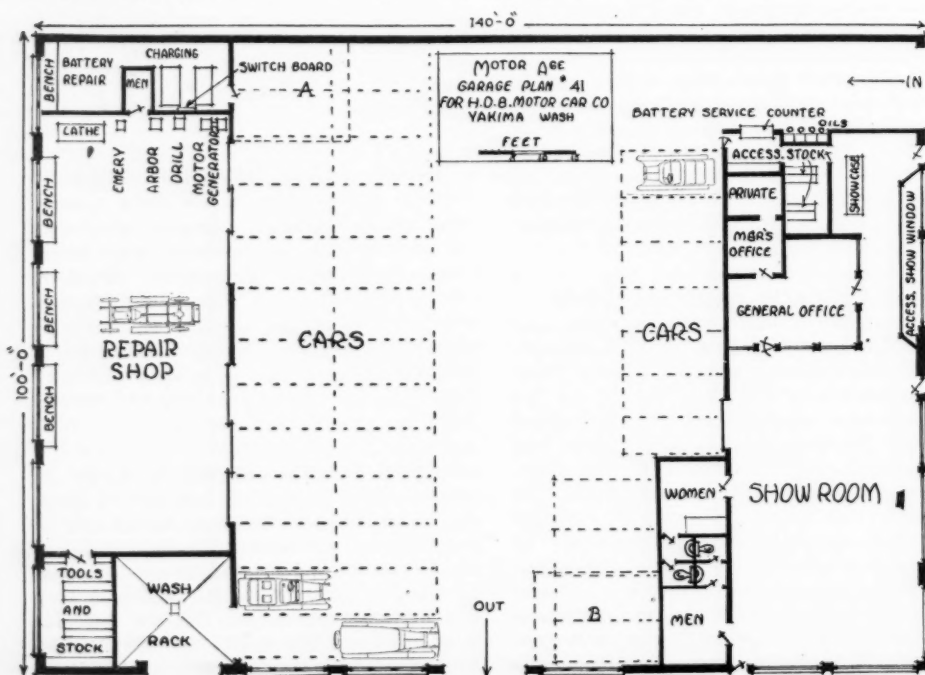
No. 42

Q—We are preparing to build a new garage and would like some plans. Our lot is 50 by 200 ft., but we expect to put up a building about 50 by 90 ft., a two-story and basement brick. Our location is adapted to front entrance only. For a depth of 60 ft. on one side we will butt up tightly against another building.

We will need storage room for about twenty cars, shop room for about eight or ten cars, a painting or varnish room for six or eight cars. The showroom is to be about 20 by 35 ft. We do not expect to show cars, only accessories, tires, etc., but might wish to show cars later. We will need a ladies' restroom, men's toilet, parts room, accessory stockroom, double wash rack, elevated office, etc. We are not in favor of ceiling over 9 ft. below, with ramp to reach upper story. The roof must drain within the building. We would like three or four pits in the shop, which preferably should be located on the second floor. The basement possibly could be run under the showroom, back for a depth of about 26 ft. Tire repairing, furnace room, etc., are in the basement. Could entrance to storage floor below and ramp to reach upper story be through one door? We expect to use wood floor above and in showroom, the balance to be concrete. We would not object to two posts or piers in the storage space below. We already have purchased joists 14, 16 and 20 ft. long, expecting main running beams to run lengthwise of building and these joists to run crosswise from them.

What should such a building cost, when of simple, plain construction? Our lot is level with the street. Is the suggestion of having storage floor about one foot below street level advisable, also the showroom about 2½ ft. above street level? Have been advised not to have basement floor more than 4 or 5 ft. below ground level on account of quicksand which is likely to be encountered deeper. A design dividing the front into four panels with entrance through one and plate glass in the other three has been suggested.—Cornwall Motor Sales Co., Cornwall, Ontario.

We have drawn your plan just about as you requested, except we have used an elevator instead of a ramp, as a ramp would make a good layout impossible on a plot of this width. If you had a plot 60 ft. wide, the situation would be different. It would be possible, however, to build a ramp in the back outside the building. We have not installed pits in the shop, as we are not certain as to the type you want. Pits will reduce the headroom on the floor below, and this must be taken into consideration



in determining the distance between floors. We believe you are making a mistake in having such low ceilings. Working conditions will be much better with a little more air above, especially in winter, when it is stuffy at best.

It is not best to have the tire-repairing room in the basement. Better have it on the shop floor, where working conditions will be more satisfactory.

Cost of labor and materials varies so much in different parts of the country and so much depends on the contractor who does the job, to give you an estimate would only mislead you. Submit your plans and specifications to some local contractors, whether you give them the job or not.

No. 43

Q—I expect to erect a first class repairshop. The size of the lot is 114 by 120 ft., with entrances on three streets. The building is to be one-story, with all the light possible. I also expect to put in a small accessory department. One of the features I would like to incorporate is a fireproof room for washing engines in the car, as it comes to the shop, before we start to work on it, with air and distillate.

The equipment will consist of three lathes, three drill presses, three emery stands, disk grinder, milling machine, possibly a cylinder grinder and all other new necessary devices.

The points on which I want information are the layout in regard to the pits, benches, stock and toolroom.—F. K., San Francisco.

Herewith is a plan drawn as you request. There is only one entrance, but you undoubtedly will want to meet all cars coming in or going out—there will be business to transact in both instances—and to have more than one door not only reduces efficiency but might even allow someone to escape without paying his bill.

The fireproof washroom can be reached only from the street side of the building, minimizing the fire risk. Of course, it is not quite as convenient, since it has no inside entrance, but the extra safety in having it entirely shut off is worth while. Also we think it quite likely the local building laws prohibit any other construction for a room of this sort.

We recommend that this room have maximum skylight ventilation. In fact, we advise leaving the roof off altogether, for the health and safety of the workman. Unless this is done, the fumes in this room will be quite strong, and there is always the possibility of an accidental spark starting a fire or an explosion.

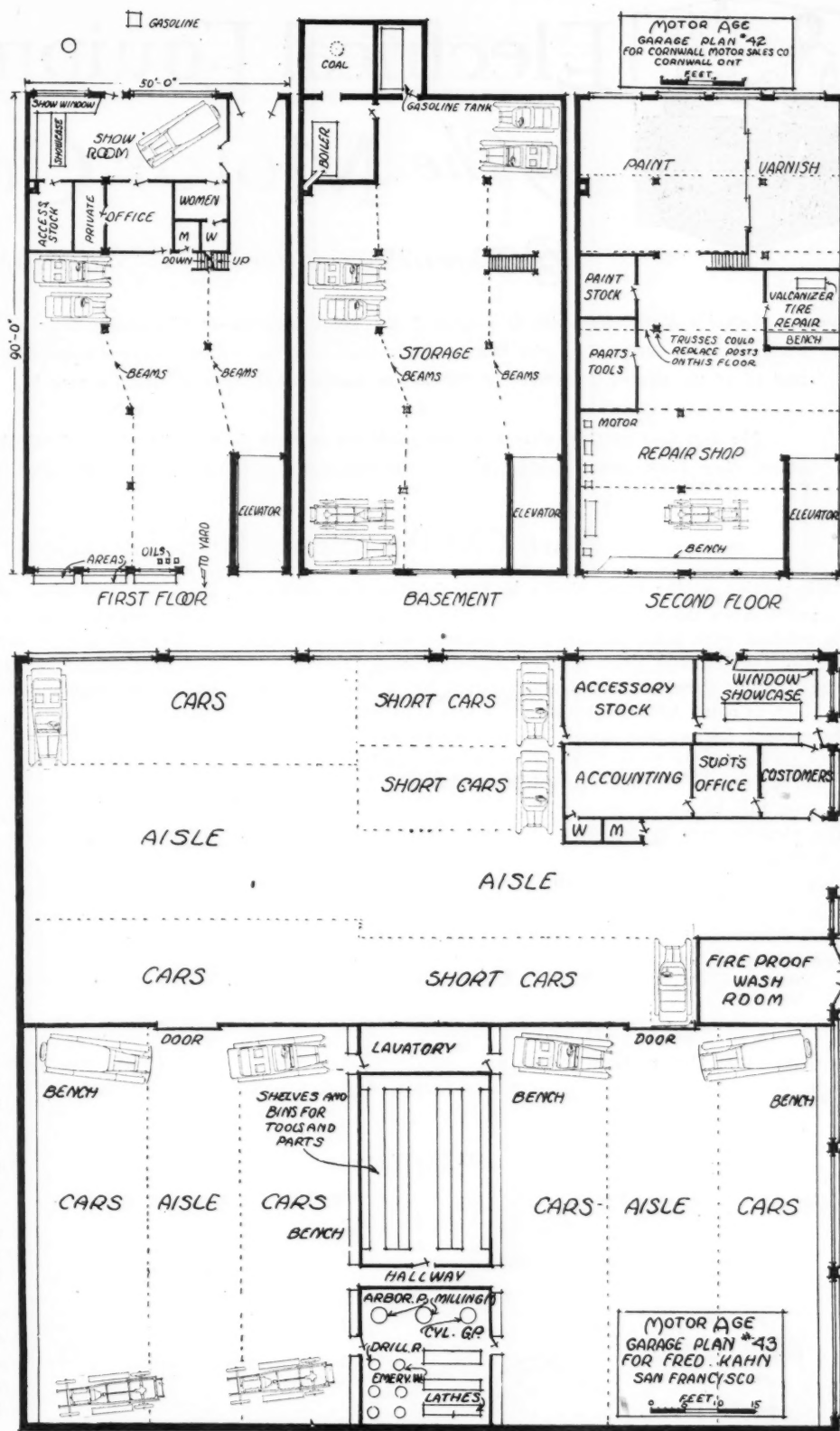
The corner of the building contains an accessory store, stockroom and offices, including a waiting room for customers and the superintendent's office.

The shop proper occupies the rear half of the building, the remainder of the front half being devoted to storage of cars which are awaiting places in the shop or cars which have been repaired and are waiting for their owners.

The shop has been laid out with a view to obtaining maximum convenience and maximum utilization of space. Perfect illumination can be obtained by the use of skylights in addition to windows.

The machine shop and the tool and parts room are placed in the center so as to be reasonably near all points in the shop. A lavatory is provided for the workmen.

The storage of cars in the front part of the building shows two arrangements. The one at the left is the usual method, and the one at the right shows the addition of an extra row of cars. There is



space for the latter method, provided only short cars are used. We have not made any provision for pits but shall be glad to do so if you will indicate what type you prefer.

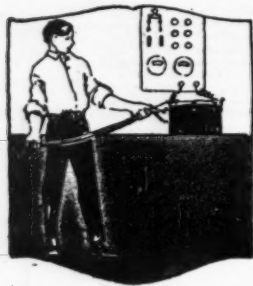
SEIBERLING HEADS HIGHWAYS

St. Louis, Mo., April 28—F. A. Seiberling, president of the Goodyear Tire & Rubber Co. and of the Lincoln Highway Association, has been appointed chairman of the new highways committee of the Cham-

ber of Commerce of the United States, which is meeting here this week.

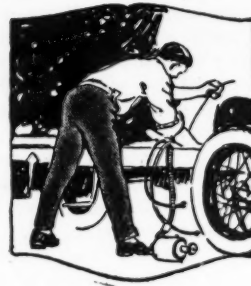
SKF SALES CONVENTION

New York, April 26—The newly organized SKF Industries, Inc., will hold a sales convention at Atlantic City April 29-May 1. The sales policies and methods of the new company, which is a consolidation of SKF Ball Bearing Co., Hess-Bright Mfg. Co., Atlas Ball Co. and Hubbard Machine Co., will be discussed.



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.



Editor's Note—Herewith is presented the 144th installment of a weekly series of articles begun in MOTOR AGE, issue of June 29, 1916, designed to give the repairman and motorist the knowledge which will enable them to care for and repair any and all of the electrical features of the car, no matter what make or model it may be.

The first half of this series has been published in book form by the U. P. C. Book Co., Inc., 243-249 West Thirty-ninth street, New York, and is sold at \$2.50. The remainder of the series will be published as a supplementary volume.

Part CXLIV—Simms-Huff Electrical Systems

THE portion of the panel shown to the right of the complete panel shows the spider in the on position. The spider arm C is in contact with point A, arm N in contact with point G and arm D in contact with point F, arms B and E being free.

The lighting circuit is now from terminal No. 5, Horn, on the fuse block to point A, through the spider arm C as before. Headlight current follows the circuit through spider arm N to point G and to headlights from point G as before. Taillight current follows the circuit through the spider arm D to point F and to tail- and dash-lamps as before.

The electric horn circuit is as follows: Starting at terminal No. 6, Bat. +, follow the bus bar to terminal No. 5, Horn, through circuit No. 5 to horn button and to the insulated terminal on the horn, through the magnet winding of the horn across the contact points to ground and thence to the storage battery.

A perspective view of the electrical installation is shown in Fig. 700 and a simplified wiring diagram is shown in Fig. 701.

Ignition on 1917 Maxwell

A diagram of the ignition system used on the 1917 Maxwell cars is shown in Fig. 702. The circuit diagrams are shown in

Figs. 697 and 698. A diagram of the magneto system used on earlier models is shown in Fig. 703.

The high-tension current for ignition is produced by the action of a non-vibrating coil on the low-tension current delivered by the generator under running conditions and by the storage battery under starting conditions. The low-tension current is delivered through the starting and ignition switches to the top of the induction coil, which is located on the base of the ignition unit.

The high-tension current is distributed to the respective cylinders by an Atwater Kent ignition unit located on the right side of the engine and driven by the engine timing gears. The distributor block which fits over the end of the timer shaft delivers the high-tension current to the brass segments, which are permanently embedded in the distributor cover, then through the high-tension wires to the spark plugs. The distributor block just clears the distributor segments without actually touching them.

When starting the engine the spark should be fully retarded to eliminate the possibility of backfiring. At medium or high speed the best results are obtained with the spark partly or fully advanced.

Never under any condition leave the switch-key in the switch when the engine is not running as the storage battery will discharge.

The ignition is properly timed to the crankshaft when the car leaves the factory, and unless the ignition unit, driveshaft couplings or timer drive gear has been removed from the engine, there should be no necessity to retune the ignition. However, if the ignition driving mechanism has been removed or disturbed for any reason, exercise care in replacing all parts so removed or disturbed. On the rear end of the timer driveshaft will be found a punch mark. This punch mark and the slot in the timer driveshaft coupling should be assembled in line and on the same side of the driveshaft center. The timer driver gear and camshaft gear are punch-marked with a double mark on the tooth of the former and between the teeth of the latter, and in assembling gears these double marks should be together while single marks on the crankshaft gear and camshaft are together. When the gears are

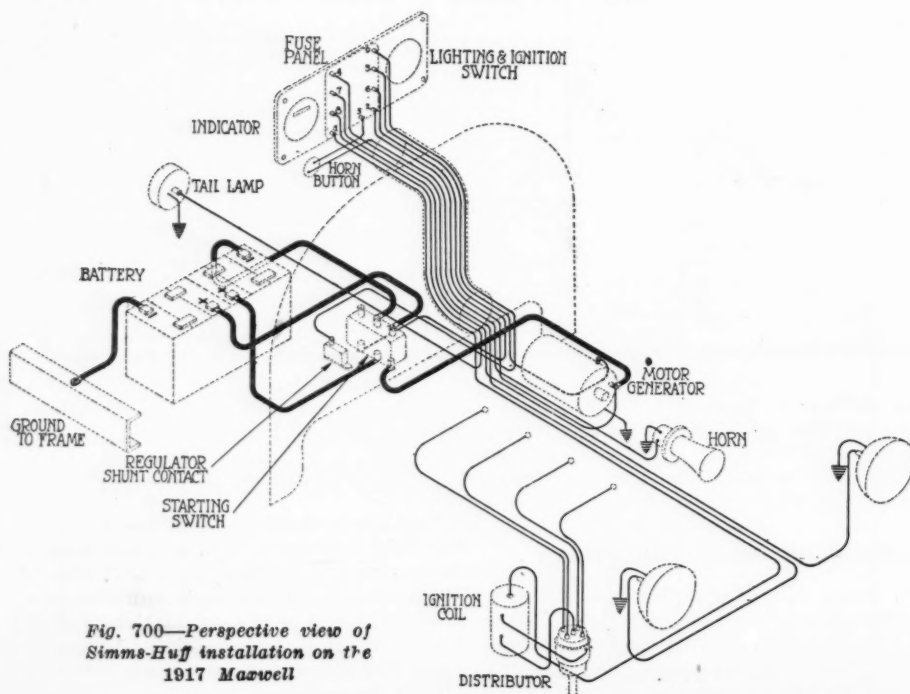


Fig. 700—Perspective view of Simms-Huff installation on the 1917 Maxwell

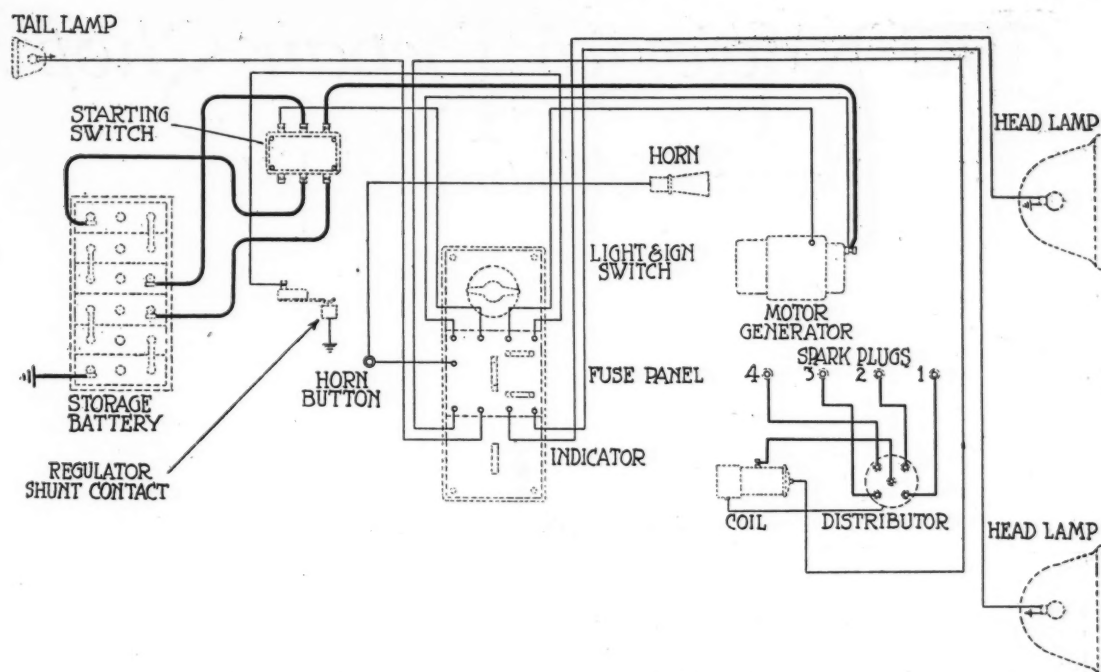


Fig. 701—Simplified wiring diagram of Simms-Huff on the 1917 Maxwell

so assembled, No. 1 piston should be in firing position and the slot in the timer driveshaft half of the coupling should be up.

In connecting the ignition unit to the timer driveshaft coupling the following applies when timer drive gear, shaft and shaft coupling are assembled properly. If the coupling has not been loosened on the timer coupling shaft, turn the crankshaft with the hand crank until No. 1 piston is $\frac{1}{2}$ in. past top dead center, or $1\frac{1}{4}$ in. past on the flywheel, on compression or firing stroke. Remove the distributor cover, which is held in place by two spring clips, and turn the timer coupling shaft until the distributor arm is brought into position opposite No. 1 segment in the distributor cover. The front right terminal on the distributor cover is No. 1. Turn the timer coupling shaft to the right or left until the coupling pin is in a position to engage in the driveshaft coupling notch. With the timer in this position couple it to the engine,

bolt to bracket and connect the terminals in the proper firing order of the engine, namely, from left to right, or clockwise, 1-3-4-2.

If the coupling has been loosened on the timer coupling shaft, place No. 1 piston and distributor arm in position as explained. Retard the breaker and turn the timer coupling shaft by the knurled collar until the platinum points just break, or in other words, just separate. Hold the coupling shaft in this position, turn the coupling on the shaft until the coupling pin is opposite the notch in the driveshaft half of the coupling and tighten the coupling clamp screw. Couple the timer to the engine and connect the terminals as previously explained. Exercise care in connecting the terminals. Be sure that they are tight and secure, and do not allow any of the high-tension cables to rub or chafe on any metallic part of the engine or car.

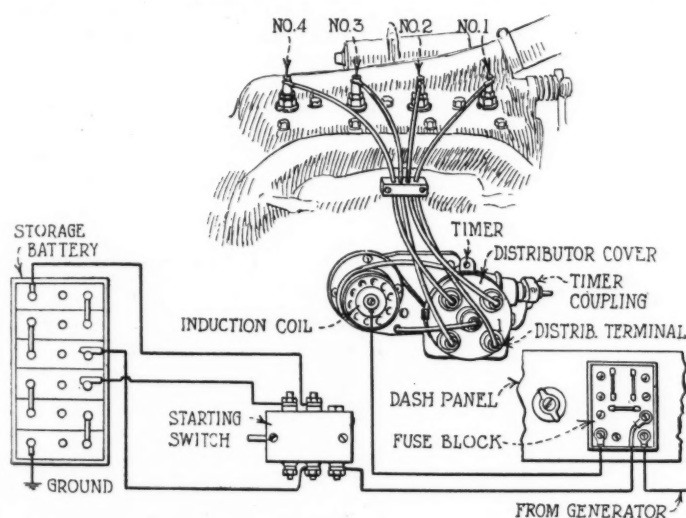


Fig. 702—Wiring diagram of Atwater Kent ignition system on the Maxwell

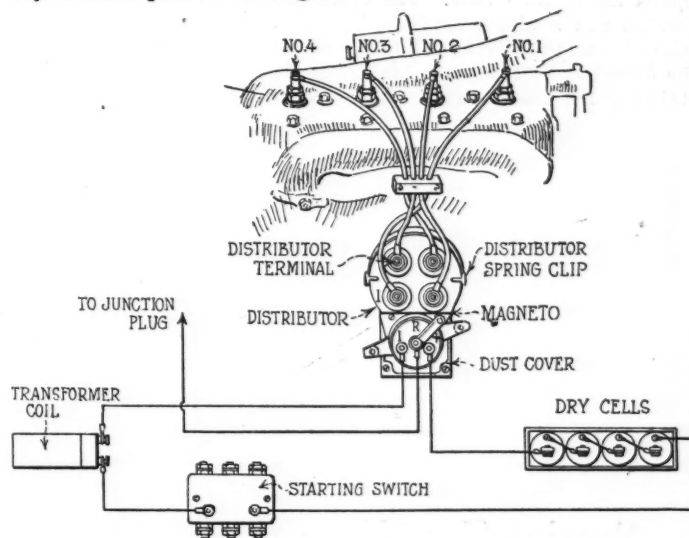


Fig. 703—Wiring diagram of Simms high-tension magneto on the Maxwell

STATE BUREAU OF AVIATION

Philadelphia, Pa., April 28—A bill has been introduced into the legislature to establish a state bureau of aerial navigation. It would create a bureau of air traffic and transportation, and regulation of air traffic would be added to the duties of the

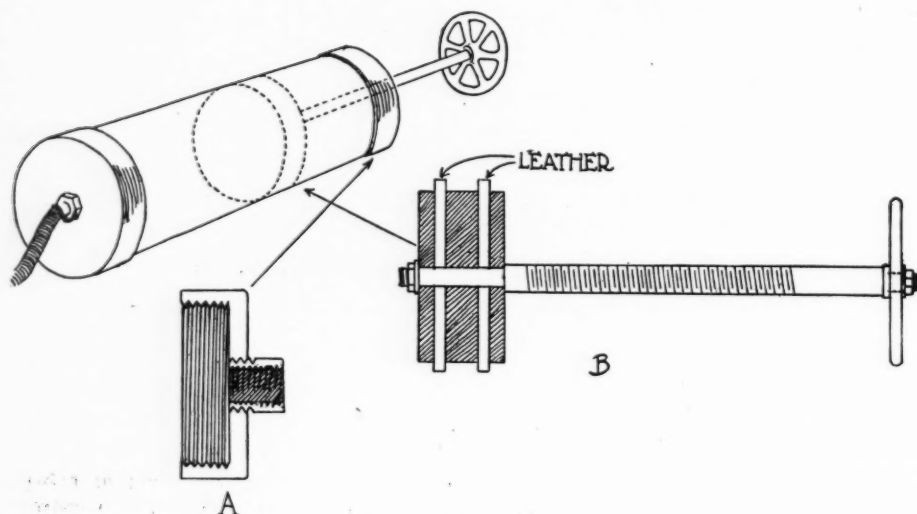
state highway department. A board is to "designate and map out air routes in the commonwealth, to mark them for the guidance of aviators, to secure landing places for airplanes and other aerial vehicles." An appropriation of \$40,000 is asked in the bill.

FORMING TRUCK ASSOCIATIONS

Philadelphia, Pa., April 26—W. H. Metcalf, secretary of the Motor Truck Association of Philadelphia, who recently went to Lancaster, Pa., to form the Lancaster Motor Truck Association, now is working to form similar associations in every county.

The Motor Car Repair Shop

Practical Maintenance Hints



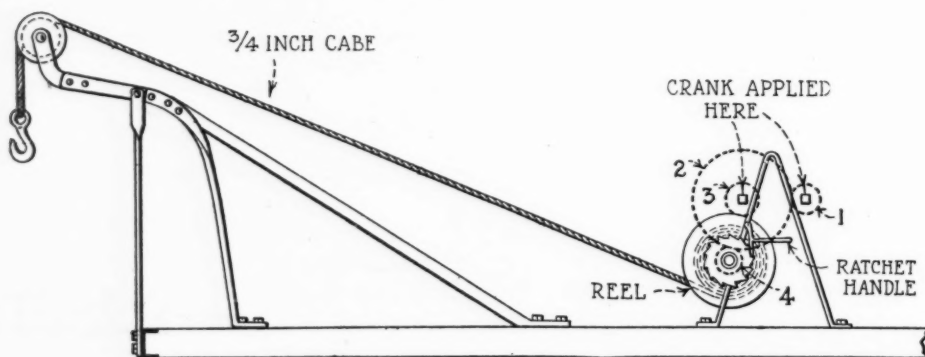
Powerful Grease Cup

A POWERFUL grease gun for filling steering joints and universals is shown in the illustration. It is made from pipe and pipe fittings, the barrel being made from a 6-in. pipe and being about 15 in. long. This is threaded at each end, and two caps specially fitted then are screwed on. One of these caps is fitted with a flexible tubing fitted to the cap first by boring the hole, then threading it and fitting a nipple for the attachment of the union joint which holds the flexible tube. The other cap is drilled and a nipple fitted to it, which is threaded on the inside to allow the piston to be forced in by the handwheel. Details of this cap are shown at A. The piston can

be made of steel, or better, of two leather disks held between steel disks as shown at B.

Filling Grease Cap

A grease gun of this construction can be used for filling grease cups by holding the cup to the nozzle and turning the handle. This insures a clean supply of grease, which is always ready for use. There are no tight covers to pry off, nor are there any open cans to collect dirt. If grease is sold to the car owner by the pound, as it often is done when it is forced into the steering column and the universal joint, the gun can be filled and weighed and weighed again after forcing in the grease and the difference of the weights gives the amount of grease used.



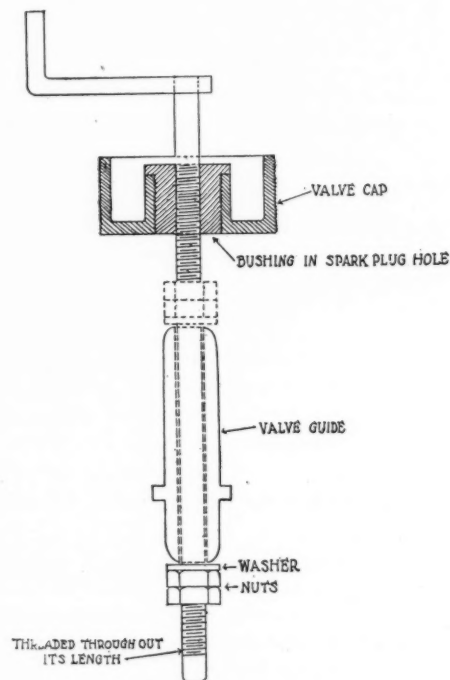
Service Car Crane

An almost infinite variety of service car cranes and towing arrangements have been devised, but the one used by a large New York truck dealer is of special interest because it incorporates a powerful winch which may be used to pull a ditched truck back onto the road or for hoisting the disabled end of a truck clear of the ground preparatory to its being towed. The construction is clearly shown. The winch

crank may be applied to either of the two squared shaft ends, one giving greater power than the other but at reduced speeds.

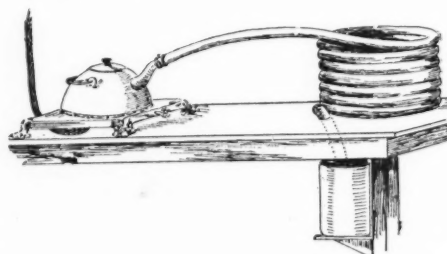
Valve Stem Guide Puller

It is not necessary to disassemble the engine or to employ an arbor press to remove and replace valve stem guides, if the tool shown is employed. This tool is simplicity itself and may be used on any L- or T-head engine. The tool consists of a bushing



This is the valve stem guide puller referred to

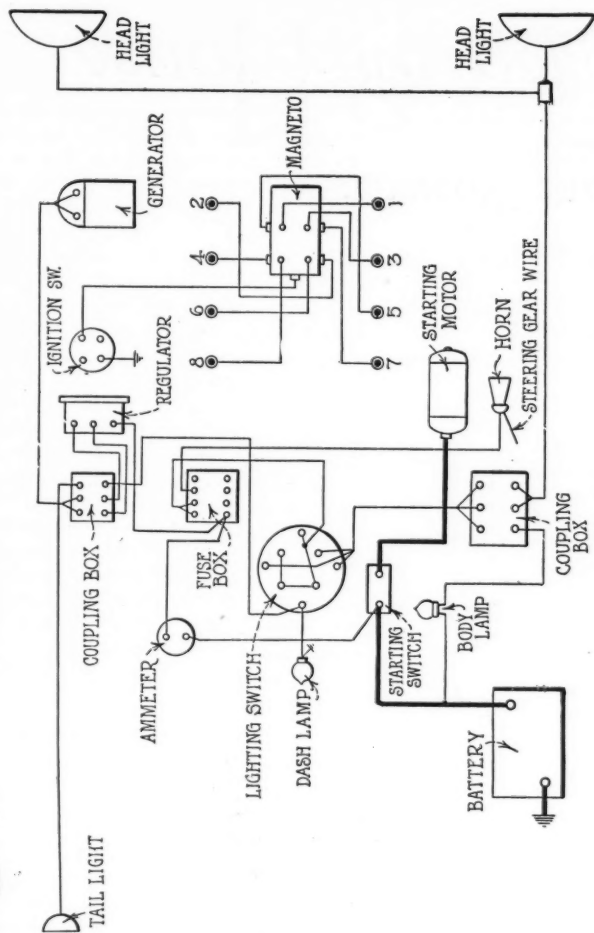
screwed firmly into the spark plug hole. By turning the handle the valve stem guide is removed or replaced, as the case may be. The illustration shows a valve stem guide about to be replaced. The guide has been slipped on the shank of the tool and then a washer backed by two nuts is put in place. Now, by turning the handle so that it screws up through the bushing, the guide quickly is drawn in place. To push a guide out the position of nuts and washer must be reversed, being placed as shown by the dotted lines.



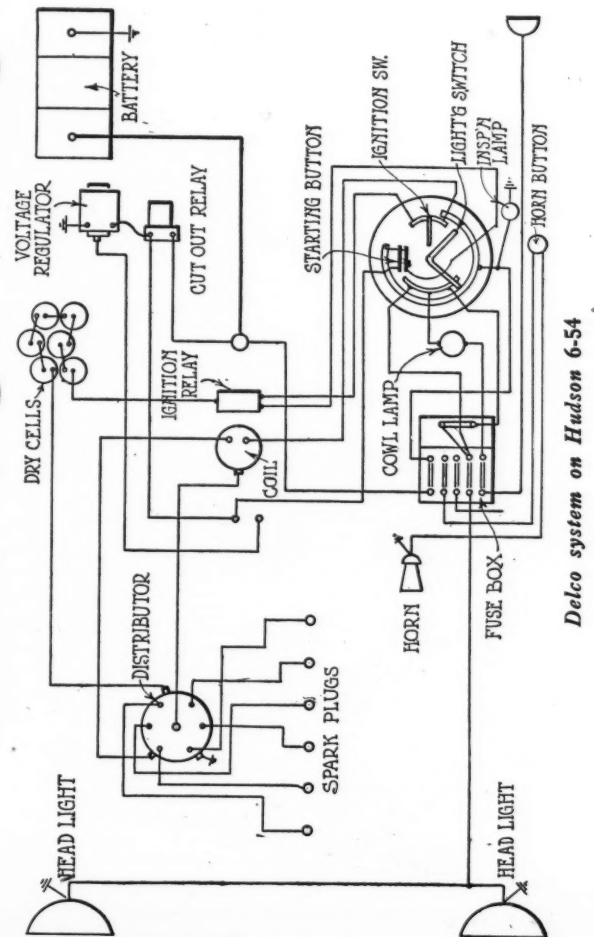
Simple Water Still

To distill water is a very simple matter, and the apparatus required may be readily improvised. Therefore, when pure water is required for batteries and none is available, it is an easy matter to make some. The apparatus illustrated shows a teakettle, some garden hose and a can for collecting the water. The water is boiled in the teakettle, condensed in the coils of the hose and caught in the can.

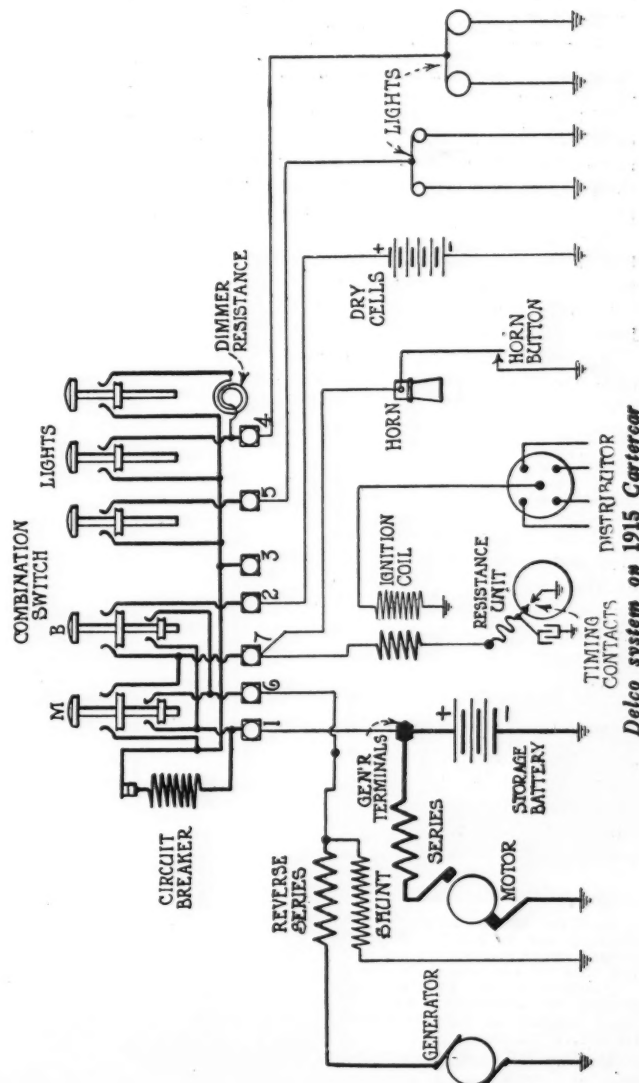
Motor Age Wiring Diagram Chart No. 26



Westinghouse starting and lighting system on 1917 Murray eight



Delco system on Hudson 6-54



Delco system on 1915 Cartecar

- | | |
|----------------------------|-----------------------------|
| Abbott—March 20-27 | Krit—Feb. 6 |
| Alco—April 24 | Lexington—April 24 |
| Alter—Nov. 14 | Little—March 20 |
| Apperson—March 6 | Locomobile—Jan. 23-April 17 |
| Buick—Nov. 21-April 3 | Marion—March 6-20 |
| Cadillac—Dec. 9 | Maxwell—Jan. 16 |
| Cole—Jan. 23-April 3 | Mercer—Jan. 23 |
| Case—Feb. 27 | Michigan—March 20 |
| Chalmers—Feb. 20 | Mitchell—Jan. 9 |
| Chandler—April 3 | Oakland—Jan. 2 |
| Chevrolet—Nov. 28-March 27 | Oldsmobile—Jan. 23 |
| Detroit—March 6 | Overland—Nov. 7-14 |
| Dodge—Dec. 12 | Premier—April 10 |
| Dort—March 13 | Pullman—April 10 |
| Elgin—Feb. 27 | Regal—Feb. 6-April 10 |
| Empire—March 13 | Reo—Feb. 27 |
| Ford—Jan. 20 | Saxon—April 17 |
| Grant—Feb. 27-March 27 | Simplex—April 17 |
| Henderson—April 3 | Scripps-Booth—Dec. 26 |
| Hudson—Dec. 5 | Stearns-Knight—April 24 |
| Hupmobile—Feb. 13 | Studebaker—Dec. 26 |
| Interstate—March 13 | Velie—April 24 |

THIS WEEK

Hudson—Cartecar—Murray

The Readers' Clearing House

Questions and Answers

Conducted by B. M. Ikert

Wrong Speedometer Reading

Q—Upon changing regular-sized tires on a 1917 Dodge Brothers touring car to oversize 33 by 4 cord tires, why will it affect the speedometer, causing it to run 5 miles too fast? For instance, when the speedometer registers 25 miles the car is only traveling 20 miles. This speedometer is driven from the transmission.—Graves Tire Repair Co., Meade, Kan.

Oversize tires always make the speedometer read less than the actual car speed. Oversized tires make the wheel larger; consequently it turns over a fewer number of times in a mile, and the speedometer reading depends upon the wheel revolutions. If these facts do not correspond with conditions as they are in your car, then the speedometer is not recording properly. If the wheels are slipping, the same result would be experienced, but then this is not probable.

Acceleration of Car

Q—A car is accelerated with a uniform acceleration of 32 f.p.s. a second. How far will it go in 25 sec, if it has an initial velocity of 5 f.p.s. a second? This acceleration is purely hypothetical, as I desire to see the mathematical steps by which this mechanical problem is solved. Show same in detail.—Howard T. Dimick, Shreveport, La.

If the car has no initial velocity, but accelerates from a standstill with a uniformly accelerated motion of 32 f.p.s. a second, then the space passed over a time, t , would be

$$S = \frac{1}{2}at^2$$

but if the car has an initial velocity, then the total distance passed over is

$$S = v_1t + \frac{1}{2}at^2,$$

here v_1 represents initial velocity.

Applying this formula to your assumed case, we have

$$S = 5 \times 25 + \frac{1}{2} \times 32 \times 25^2 = 10,125 \text{ ft.,}$$

which is slightly under 2 miles.

Wants Data on Doble

Q—When will Doble put its steam car on the market?—J. Murphy, Jacksonville, Fla.

At the present time we have no information as to when Doble will put its steam car on the market, but we are endeavoring to secure this information and will publish same as soon as we hear anything in regard to it.

Dealer Wants Double Garage

Q—Furnish plan for a double garage, covered with callstone, for two Super-Six Hudsons.—Jones Bros. Auto Co., Toledo, Iowa.

In Fig. 1 is a suggestion for your garage for two Hudsons. It is in half-timbered effect with extension gable supported on brackets protecting the entrance.

Mitchell Transmission Noisy

Q—The transmission in my Mitchell C-42 touring car is noisy. Recently I replaced a broken roller bearing on end of sliding gearshaft, but this did not eliminate the noise.

2—How much backlash should the drive pinion in differential have to run with the least amount of noise?—Clarence P. Engberg, Casper, Wyo.

1—The Mitchell transmission is shown in Fig. 2. The small cap which holds the

Miscellaneous

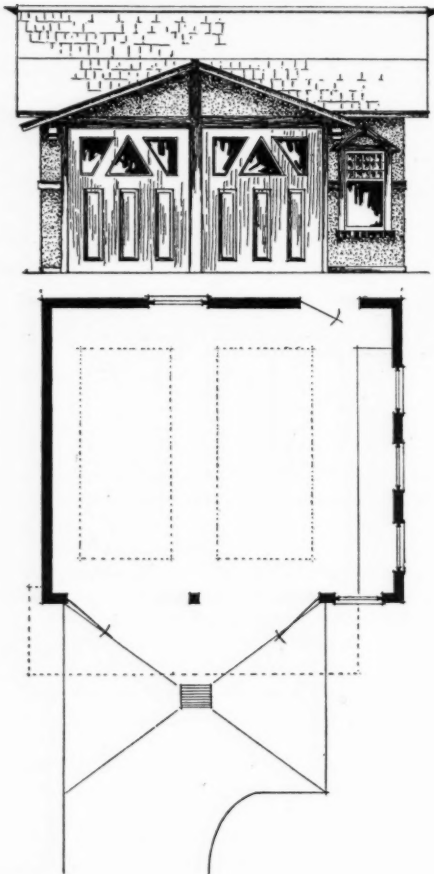


Fig. 1—Two-car garage designed for dealer

bearing of the countershaft can be removed, and this will allow the roller bearing to be taken out. We believe you will

find here, either at the front or the rear, a broken roller. While this cap is off the old grease can be cleaned out very thoroughly by pouring through several times a solution of hot soapy water. This will clean out all the grease, and after the work is done the housing can be dried out with small cloths shoved into the corners to absorb what little water does remain. Replace the caps after this and adjust the set screws which hold the countershaft in position. These set screws should be adjusted with the rear wheels jacked up and the engine going. The position of least noise then can be found.

2—A peripheral movement of about 3 or 4 in. is right.

Wants Tire Information

Q—Can you give me any information regarding tire fillers? I have had frightful experiences with tire let-downs and have to spend most of my time pumping tires.—A. C. Nellis, Richey, Mont.

MOTOR AGE cannot make recommendations in this matter. Why not have your wheels fitted for demountable rims and then carry an extra tire inflated and ready for use? A set of four wheels with felloes and five rims will cost in the neighborhood of \$20 and you can take off the old spokes and felloes and bolt on the new ones yourself. This scheme will give you the same size tires all around and it will be necessary to carry only one spare tire and then your back-breaking troubles will be over.

Play in Pump Shaft

Q—There is considerable play in the pump and distributor shaft of this 1917 Dodge Brothers car. It is enough so as to affect the timing of the distributor to a small extent. Would this cause a noise similar to that described by C. W. Harter, Jr., on page 41 of the Feb. 20 issue of MOTOR AGE?

2—If so, how could it be remedied?

3—What should the oil pressure gage show at approximately 20 m.p.h.?

4—Is there any method of regulating the pressure?—Harry P. Rambo, Wilkinsburg, Pa.

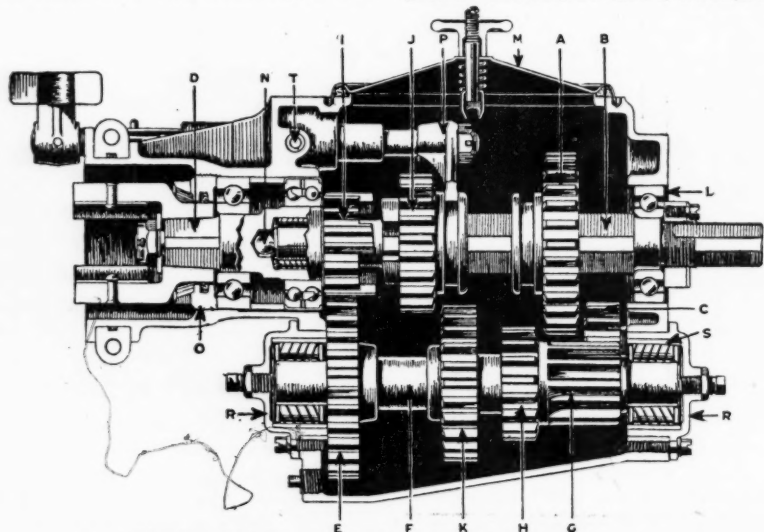


Fig. 2—Mitchell gearset, showing points of adjustment

1—Any perceptible play in the coupling or universal joint between the pump and distributor naturally would cause some disturbance in perfect ignition timing and also would be apt to cause something of a knock. It will do no particular harm except that it will become worse with time, and as long as it ought to be remedied it is better to do it at once.

2—There is little that can be done except to replace the universal coupling parts. If there is play in the pump shaft, this may cause the noise. The end plate of the pump shaft can be removed and a shim placed between the gear and the front pump shaft bearing.

3—When the engine is heated, so the oil is warm and consequently comparatively thin, about $1\frac{1}{2}$ to 2 lb. The pressure will be greater when the engine is cold, however.

4—No, unless the tension on the spring in the oil gage is changed. This will not change the pressure but will alter the position of the hand on the indicator.

Rickenbacker in His Maxwell

Q—Publish a photograph of Rickenbacker's Maxwell racer.

2—Which way is best to remedy a loose wheel on the axle shaft?

3—When is the maximum speed of the Maxwell?—S. O. Topness, St. Croix Falls, Wis.

1—See Fig. 3.

2—We assume you mean the rear wheel on the Maxwell. If this is right, then the side play can be eliminated by first removing the wheel and making sure the tapered joint is in good condition and that the tapered hole in the wheel can fit snugly to the taper on the axle. If the tapered portion of the axle is scored or burred the axle should be removed by taking out the split washer on the differential end of the shaft and then pulling the shaft out. The shaft then should be placed in a lathe and a light finish cut of 0.001 or so taken, after which it will probably fit the wheel. Then replace and pull up tight on the nut that holds the wheel to the taper, and lock the nut with the cotter pin.

3—Maxwell touring cars generally average about 45 m. p. h. for their maximum speed.

Adjusting Ford Gears

Q—I have had a Ford touring car two years and run 10,000 miles. Should the differential be examined? Some claim the thrust washers back of the ring gear wheel wear and cause the gears not to mesh properly.

2—Could this be detected by noise?

3—Would this job be too much for an amateur?—W. H. Dowker, Danville, Ill.

1—If the rear system has been cared for properly and has had ample lubrication, this distance should not cause material wear, that is, of course, presuming there was correct adjustment in the beginning. There is one thing certain—it is cheaper to take it down, make the inspection and remove any doubt—and trouble if any exists—than to take the chance that it is all right and then have something happen.

2—If the gears were not meshed properly, noise would develop. If too tightly meshed, there would be a hum; if not tight enough, you can tell this by jacking up the axle and turning one wheel while the other is in a fixed position. By taking out the spark plugs and turning the engine over very gently while somebody holds the wheels you will be able to see if there is any material backlash. This, however, can

TO assist readers in obtaining as a unit all information contained in this department on a certain subject MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MISCELLANEOUS

Graves Tire Repair Co. Meade, Kan.
Howard T. Dimick Shreveport, La.
J. Murphy Jacksonville, Fla.
Jones Bros. Auto Co. Toledo, Iowa
Clarence P. Engberg Casper, Wyo.
A. C. Nellis Richey, Mont.
Harry P. Rambo Wilkinsburg, Pa.
S. O. Topness St. Croix Falls, Wis.
W. H. Dowker Danville, Ill.
Howard L. Cook Great Falls, Mont.
W. F. Gerdes Mims, Fla.
Reader West Liberty, Iowa
Dallas Lanning Gilmore, Ohio
H. Harris Minneapolis, Minn.
Reader New Castle, Pa.
W. W. Bissell Zearing, Iowa

LUBRICATION

J. M. Swartley Cleveland, Ohio
Maj. Louis Thexton Chicago
Robert L. Boyer Newman, Ill.
E. C. Metcalf Waupun, Wis.

CARBURETION

Robert B. Biggs Tiffin, Iowa
Alfred B. Stratton Hutchinson, Kan.
W. Wilson Great Falls, Mont.
A. E. Reynolds Mexico City, Mexico

ENGINES

Alfred Lobinger Youngstown, Ohio
P. A. Guiles Abilene, Kan.
Morgan Sherrod Courtland, Ala.
C. C. Hermann Moline, Ill.
Pere Wickes Port Royal, S. C.
C. M. Jones Yakima, Wash.
Theodore Stanke Winona, Minn.
A. C. Nellis Richey, Mont.

THE ELECTRIC SYSTEM

E. C. Metcalf Waupun, Wis.
Roy F. Himelick Frederic, Iowa
C. W. St. George Dallas, Tex.
Bethel P. Browne Henderson, Ky.
W. M. Wright Trenton, Mo.

REBUILDING

Reader Galva, Ill.
A. E. Reynolds Mexico City, Mexico
Bethel P. Browne Henderson, Ky.

No communication without the writer's name and address will be answered in these columns.

be told by trying the wheels very gently. If there is much play, it will be well to have this removed.

3—This all depends on the mechanical ability of the amateur—some could do it with success and others might make such a poor job of it material damage might result. We would suggest you take it to the

Ford representative and have him make an examination and adjustment, for he will know just what is to be done and it will prove the cheapest in the end. There is no adjustment on the Ford rear axle gears as on other cars, and the only way to take up the play is to fit new thrust washers, consisting of two steel washers and a lead washer between them. The older models had a bronze washer in the center. You also can buy ball bearing thrust washers for Fords, costing \$3 or \$4.

Changing Steering Gear

Q—I am setting the steering gear on a Ford back about 2 in. Would this affect the steering?—Howard L. Cook, Great Falls, Mont.

The steering arm ought to be parallel with the tiebar to make effective steering, but if you mean you are dropping the wheel without actually setting the lower end farther back it will make no difference. If you actually set the wheel back, then it would be better to put in a longer shaft so the arm still will come directly over and be parallel to the tiebar. Probably it would steer, but you would not have such direct leverage if the arm is placed at an angle to the tiebar. If you proceed along the line suggested, that is, having the arm tangent to the tiebar, jack up the front axle and try turning the wheels to see that they operate correctly; and be careful the first time on the road so you will have a perfect understanding of the working of the steering apparatus.

Old Car Information

Q—Is the F. A. Brownell Motor Co., Rochester, N.Y., making the same six-cylinder engine as it did nine years ago?

2—How is the Stewart speedometer taken apart for repair? This one was manufactured in 1910.

3—Are 36 by 4-in. tires still being made? How about the cars that use this size tire?—W. F. Gerdes, Mims, Fla.

1—Engine designs have changed materially in the last nine years and it is not likely exactly the same engine is being manufactured to-day, for it would be out of date and not salable. It is probable, however, that if you wanted parts for such an engine the manufacturer can furnish them.

2—This is essentially a job for either

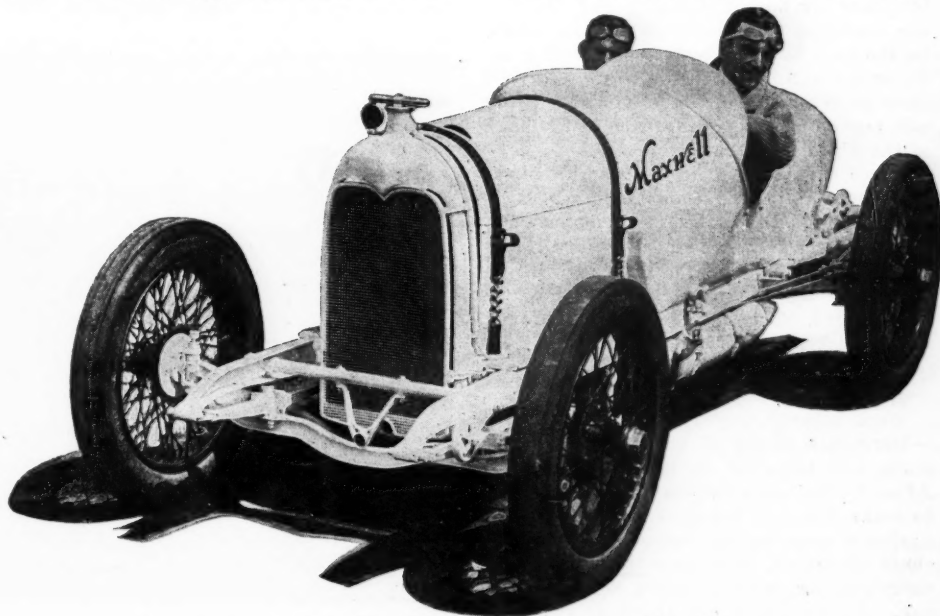


Fig. 3—Eddie Rickenbacker in his Maxwell racer

the manufacturer of the speedometer or somebody making a specialty of speedometer repairs. If anything, we would advise sending it to the Stewart-Warner Corp., Chicago. Probably you will find it is not worth the expense to have such an old instrument repaired.

3—There are not many cars that use this size tires now, but most of the tire makers will be able to furnish them.

Oil Pump Off Cam

Q—Will you publish a drawing of an oil pump that will work off of a cam on the camshaft of a Ford car and state size of piping most satisfactory?

2—Where can I get timing gears and cover for the right or left side of my Ford?—Howard L. Cook, Great Falls, Mont.

1—This subject was covered completely, with illustrations, in *MOTOR AGE* of Sept. 12, 1918.

2—If reference is made to the regular camshaft gear that is on the right side of the Ford car, it may be procured from any Ford agent or from any of the many Ford branches. Possibly the desire is for a gear to be driven by the crankshaft gear to drive a magneto shaft. Many of the magneto makers have such gears in stock, but the drive gear is attached to the external portion of the crankshaft and a chain is used to drive the magneto shaft. The Bosch company carries such equipment, designed to operate a Bosch magneto for a Ford.

Water Pump on Ford

Q—I have a water pumpshaft and DU4 Bosch magneto that I got off of an old Buick four. Would this pump be of any advantage if I put it on the left side of my Ford car and attached the magneto on the end of the shaft?—Howard L. Cook, Great Falls, Mont.

There is no reason why this would not work. There would have to be a gear attached to the crankshaft to drive the combined pump and magneto shaft through a chain. Possibly Bosch can furnish you with a bracket for the magneto and the gear and chain necessary to make the connections. Just how much you will gain by using a pump will be determined by experimenting a little. The Ford is not designed for a pump, and because of using the thermo-siphon system the inlet and outlet pipes for both the engine and radiator are made considerably larger than would be the case if a pump were used. The additional speed at which the water is driven through the medium of the pump probably will make up for the difference in the sizes of the pipes, however.

There should be some form of universal joint or coupling between the pump shaft and the magneto shaft, so the magneto can be timed correctly and also so any slight misalignment of the two shafts will be cared for by the flexibility of the universal joint. This may be of the improved double-disk leather type if desired.

Drag Saw on Cadillac

West Liberty, Iowa, Editor *MOTOR AGE*—Here is a photo of a drag saw I have made and installed on my 1910 Cadillac. After I decided on the kind of rig I wanted to make, the first thing to do was to make a sleeve coupling to fasten on the main shaft of engine, then to make a frame to carry the rig, which I made out of 2 by 4 oak. I extended it out about 36 in., then on frame I placed the planetary transmis-

sion with end of shaft fastened in sleeve on engine shaft, to the driveshaft of the transmission. I fastened a hollow shaft and let it extend out beyond the bearing on frame about 4 in. On this I placed the lower guide rods block. These rods are about 1 in. in diameter, 48 in. long. On these rods slides the saw block which the saw is bolted to. These rods are about 5 in. apart.

The block on the outer end has a clamp or slot to guide the saw. Then on the outer end of hollow transmission shaft I clamped a crank arm that fastened to the saw block and pulls the saw back and forth. Now to start the engine you will have to make a crank that will slip inside the hollow shaft and catch a pin in main shaft in this way you crank the engine as usual. To start saw clamp the low speed band on the transmission. This allows the driveshaft of the transmission to move about three and a half times slower than the driveshaft.

A sliding gear would be much better as one could then run the saw slower, but as my engine idles rather slowly I am able to run very well from the planetary transmission. With a high-speed engine one would have to gear back six or eight times to get best results.

Some sort of anchor will have to be provided for between frame and log. I made one out of a 2 by 4 and hinged it close to the two guide bars and run it out about 10 in. past the outer guide block. On the end of the 2 by 4 I bolted a flat iron plate with a 1/2-in. hole in it. To anchor the log I drive a steel pin through the hole in the log which makes it very rigid.—V. R. Lane.

Adjusting Rear Axle Gears

Q—Illustrate how to adjust ring gear and drive pinion on a Dodge Brothers car. What is the proper depth to mesh these gears? How are these gears tested to show when correct adjustment is made? What is the proper adjustment for the two caps that hold the bearings up against the differential carrier?

2—Should these two caps be bolted up tight so that the shoulder of each cap should fit up tight against differential carrier?

3—How should the multiple-disk clutch on a Dodge Brothers car be cleaned? What should be used to prevent it from slipping?—Dallas Lanning, Gilmore, Ohio.

1—A sectional view of the Dodge Brothers rear axle is shown in Fig. 5. The differential carrier to which the torque tube

is riveted supports the bearings on which both the propeller shaft and the differential run. The differential and bevel-driven gear form one unit, being supported by two Timken roller bearings, which are easily adjusted. There are two lock screws on the outside of the rear axle housing between the hand brake camshaft and the axle housing itself. These screws must be unscrewed from the differential carrier and then the bearing adjustment rings on each side of the differential can be moved to mesh the gears properly. You will be able to grasp this better when you look into the differential and note the construction. The gears are meshed properly when a very thin piece of paper will pass between the teeth without being destroyed. Be sure to replace the lock screws which keep the adjusting rings from turning.

Correct adjustment also can be told when there is no perceptible noise from the rear axle, such as the humming sound arising from gears meshed too loosely, or the grating noise from those meshed too deeply.

2—Do not worry about the position of the adjusting rings as long as the gears are correctly meshed. It is not necessary that the shoulder on these come up to the differential carrier.

3—This is a cone clutch and requires occasionally an application of neatsfoot oil on the leather to soften it. If the leather has become hard and glazed, the clutch has a tendency to slip. A remedy for a grabbing clutch is to wash the leather with gasoline and apply castor oil. If the leather slips in the fully engaged position, clean the surface with gasoline and take up on the clutch spring. Keep the drain plug in the bottom of the housing open so no oil can accumulate in it.

Reader Gives Experience

Minneapolis, Minn.—Editor *MOTOR AGE*—In the Feb. 27 issue W. L. Brown, McPherson, Kan., told of his experience with a 1915 Dodge. The writer has had practically the same experience with the same model. After trying all other remedies, I took off the muffler and found the trouble to be in that member. The exhaust pipe had slipped back into the muffler until the end came in contact with a partition inside.



Fig. 4—Drag saw installed on old Cadillac car

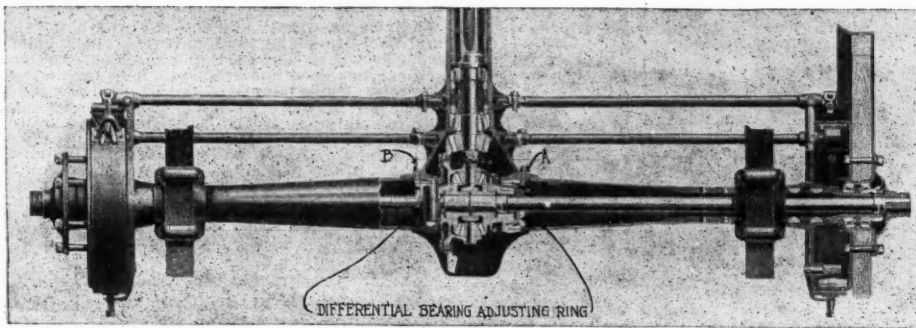


Fig. 5—Rear axle of Dodge Brothers car, showing points of adjustment

The exhaust pipe B, Fig. 6, should have been secured from sliding back by a pin passed through the holes at C, but this pin had been taken out or lost and it allowed the pipe to slip back against the partition A, thus almost completely cutting off the escape of gas.—H. Harris.

Care of Car Finish

Q—Give directions for removing mud spots from the finish of new car.

2—Who manufactures the American B and American Beauty shown on line two and three of the passenger car specification table this month?—Reader, New Castle, Pa.

1—Car manufacturers advise that mud be removed after each run, before it is dry if possible, for if allowed to dry the finish of the car will lose its luster at that spot. To remove mud, use a hose with the nozzle removed and sufficient force to carry the stream only 6 in. Extremely hot or cold water never should be used. After the dirt and grit are removed wipe dry with a soft chamois and then polish with a good grade of furniture polish or crude oil. If crude oil is used for polish, it should be rubbed on with a soft piece of cheesecloth and then the surface polished with a soft cloth dampened slightly with water. Hardened grease can be removed with a slight amount of turpentine. Polish the surface immediately.

2—The American B is made by the American Motors Corp., Plainfield, N. J., and the American Beauty is made by the Pan American Motors Co., Decatur, Ill.

Ready-Made Tube Deflator

Zearing, Iowa, Editor MOTOR AGE—Noting an article in a late issue showing how to make a tube deflator, would call your attention to a quicker, better and very satisfactory tube deflator which can be found ready-made in nearly any shop. This is the common wood screw of medium size. If it is a very large or very small one, it will not secure the desired results. Insert the point of the screw between the valve stem and the inside wall and press down slightly, at the same time turning to the right. I have used this method for many years and have never yet injured either the valve or stem.—W. W. Bissell.

Lubrication

Buick Leaks Oil

Q—How can the oil be prevented from leaking out around the crankshaft at the crank end on a Buick B37?—J. M. Swartley, Cleveland, Ohio.

An oil leak of this nature occurs generally after the front plate has been removed. In Fig. 7 is shown the timing gear hous-

ing with the plate removed. The thicker portion of the shaft is the part that runs in the bearing of the housing plate. Road dust is one of the contributing factors for this leak, because the bearing in the plate wears more rapidly and the shaft clearance soon becomes larger than the natural oil film, and when the plate is replaced the weight of the plate lets it slip down and the total clearance is then at the bottom of the shaft. Generally a new gasket also is put in at this time, and it is thicker than the old gasket. This holds the plate farther away from the bearing, and the tendency for the oil to leak is increased. The remedy is to use a thinner gasket and to place the plate so that the clearance between the shaft and the bearing is taken up evenly.

Self-Lubricating Car

Chicago, Editor MOTOR AGE—Having in the last ten years owned and operated eight cars, all of which I have driven and cared for myself and nearly all of which have gone to the junk pits because of faulty lubrication, I am now in a position to advise inventors and manufacturers, even though I am unable to suggest the proper means to overcome the defects.

The oiling system of cars has been greatly improved in the past decade. It still remains for some genius to devise a method so complete that every movable part of machinery receives lubrication from a reservoir which can be filled at the same time that oil is poured into the crankcase and gas into the tank.

These three receptacles should be so arranged that, as the gas tank becomes empty and calls for filling, a definite amount of lubricant can be added to the containers, oiling all parts of the car. This, I believe, can be figured out so accurately that if the owner observing he is out of gasoline finds the oil and grease container is still half full, he knows at once some part of the lubrication system is not working and can start an investigation to find where it is.

Each part should have its own feed pipe and this should be so arranged that it easily can be disconnected and cleaned in case it became clogged. A small by-pass could be attached for this purpose.

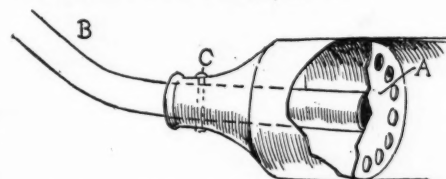


Fig. 6—How reader keeps exhaust pipe from slipping

In the last season I have ruined one generator for want of lubrication and again put it out of commission because too much oil was used later, which caused a short-circuit. A part like this should be supplied from a feed pipe which can be opened for a few minutes and then closed instead of relying on an oil can, which every owner hates to handle and therefore neglects to use.

The steering gear should be packed in grease the same as the wheels and require changing only once in a season. Spring bolts, brake rods and all bolts holding these in place, and moving only occasionally, should be packed in grease and not depend on the owner turning down his grease cups every 100 miles and refilling every week. We all know this is not done faithfully, and as a result our springs squeal and our brakes freeze and call for a trip to the repairshop or cause an accident by not functioning properly when needed in an emergency.

In these days when owners are driving their own cars and previous chauffeurs are engaged in more necessary occupations it is more than necessary that such attention can be given by the owner to his car without the soiling of hands and clothes.

The great convenience of being able to drive to one of our numerous filling stations, having our tanks filled with gasoline, our tires with air, our engine, our lubricating tank with oil every 200 miles makes the matter of driving one's own car very simple and a pleasure. It also relieves another man for the necessary stations which at the present time are so hard to fill.—Maj. Louis Thexton.

Willys-Knight Lubrication

Q—How does the oil in the 1916 Willys-Knight engine get to the piston pins and to the rings in the head of the cylinder and the sleeves?—Robert L. Boyer, Newman, Ill.

The oil in the Willys-Knight engine is pumped under pressure to the crankshaft bearings and the connecting rod bearings through the drilled oil leads in the shaft. The overflow then is splashed to the sleeves which have oil-spreading grooves in them. The lower grooves are drilled to facilitate oil spreading to the inner sleeve. The system is illustrated in Fig. 8.

Oil Circulation in Stutz

Q—Publish sectional view of engine used in 1917 Stutz four-passenger, showing oil circulation, and give specifications of this car?

2—What is the brake horsepower of this engine?

3—Are the crankshaft and connecting rod bearings equipped with shims?

4—If a shim of, say, 0.001 or 0.002 in. were taken out, would it be necessary to scrape the bearing?

5—What is the gear ratio of this car on high?

6—Would one have much trouble painting a black car ivory white leaving the original paint on if it is smooth?

7—Would it last any length of time, or would the black show through?

8—How many coats of paint and varnish is necessary for a good job?—E. C. Metcalf, Wau-pun, Wis.

1—Front and side sectional views of the Wisconsin AU engine are shown in Fig. 12. This is the engine used in the Stutz, except a special crankcase is used on the Stutz. The general specifications are the same. The bore is $4\frac{1}{4}$ in. and the stroke $5\frac{1}{2}$ in., being of the four-cylinder type. It would be impossible to show the details of the oiling system in either the end or side sectional views. Oil is pumped by a gear pump located on the outside of the

lower crankcase and is driven by spiral gears from the camshaft. It is forced to a main duct cast integral with the crankcase and from there distributed by ducts, cast in the web, to the main bearings.

From here it is forced through a hollow crankshaft to the connecting rod bearings, and thus a constant stream of oil is forced over each bearing when the engine is started. A fine wire gauze strainer is fitted to the opening of the oil pump to prevent grit or sand getting into the bearings. A sufficient amount of oil is thrown off by the connecting rods to lubricate the pistons and camshaft, both of which are provided with oil pockets. An oil gage extending to the level of the crankcase and located on the exhaust side of the engine indicates by a float and ball the exact amount of oil contained in the reservoir. Distinct marks on the glass gage show the high and low marks, and if the oil is maintained between these two levels, no burnt oil is emitted, nor is there danger of cutting the bearings. The oil pump and strainer can be removed from the bottom of the engine without disturbing the other parts.

2—The N. A. C. C. formula gives the horsepower of this engine as 36.1.

3—Yes, all of them.

4—It is not likely when so little is removed. This can best be told by an examination to see if some particular spot shows excessive wear.

5—The gear ratio is $3\frac{1}{2}$ to 1.

6—Yes, it would prove a most unsatisfactory job unless the old paint were removed either by burning off or with the use of some sort of varnish remover. Besides, white will prove unsatisfactory after the car has been subjected to a little use and when grease and dirt have had opportunity to settle on it.

7—It would take a good many coats to cover the black, but if the work is thoroughly done the black should not show through unless the white paint happened to be marred.

8—It depends upon the price of the job. On an ordinary and inexpensive job from four to six coats, all told, will turn out a fair job; the best work requires from a dozen to fifteen or eighteen coats.

Carburetion

Probably Clogged Fuel Line

Q—I cannot seem to get any gasoline to the cylinders of a Velle 28, which has a Stromberg carburetor. When I go a certain distance the engine begins to spit, and if I do not throw out the clutch the car will stop. I throw out the clutch and it will spit just the same, no matter if I open or close the air or raise the high-speed needle. The water in the cooling system boils in a little while. How would it be to put a larger jet in the carburetor? I cleaned out the gasoline tank, vacuum system, carburetor and gasoline lines. The spark is timed all right. When it gets to spitting I just stop for a few minutes and then it runs good for 2 or 3 miles and has plenty of power.

2—Give instructions to time a 1914 Harley-Davidson motorcycle. Are they timed on the same order as a motor car?—Robert B. Biggs, Tiffin, Iowa.

1—The very fact that at times you can run all right for 2 or 3 miles plainly shows the adjustment is reasonably correct and that the float level is set properly. Your description of the trouble would lead one to believe there is something in the spray nozzle, despite the fact that you have made an effort to clean out all parts. The writer had just such an experience with a

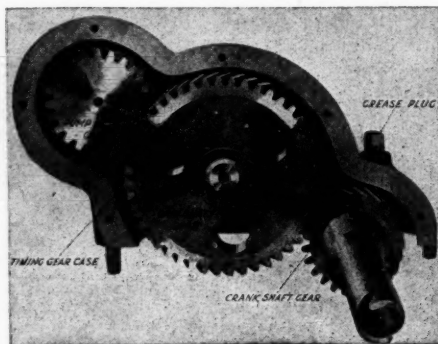


Fig. 7—Buick timing gear housing with plate removed

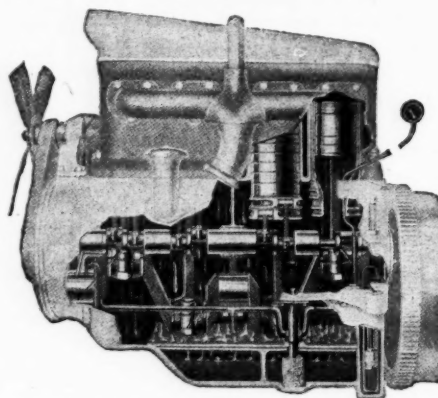


Fig. 8—Cross-section of Willys-Knight engine, showing lubrication system

Stromberg carburetor but eventually found what seemed to be pulp in the spray nozzle. Some little particle of something is floating with the gasoline, and when suction takes place it is drawn gradually into the spray nozzle. Then when you stop it drops back and the engine will run as long as gasoline can pass through the spray nozzle. It is not a fact that the engine gradually loses power or that it misses on some cylinders? Take out the spray nozzle and make sure there is not some foreign substance in it or floating in the gasoline line. Heating of the engine would be caused by too lean a mixture when under a pull, and this also indicates a lack of fuel.

2—Yes. Place the piston on top dead center, retard the spark fully and set the ignition so it begins to break at this point.

Carburetor Needs Adjusting

Q—I have a 1918 Ford coupe which does not run smoothly. The engine runs unevenly and when running between 5 and 15 m.p.h. the car

jerks unless speeding up or slowing down. The car has a new timer and roller, also a new cable and oversize piston and patented rings in the front cylinder. The valves have been ground and the car has good compression. The engine runs fine idle. Plugs have been cleaned and new plugs tried, but they are no better than the old ones. Do you think it is the carburetor, and will I need a new one?—Alfred B. Stratton, Hutchinson, Kan.

Your trouble is plainly in the adjustment of the carburetor, having too rich a mixture, for it loads badly. If cutting down on the needle valve does not bring a remedy, it is more than likely the float level is so high there is a superabundance of gasoline. In this case it is almost impossible to obtain an adjustment, for no matter if the needle valve is set ever so close it still will permit too much gasoline to go through. It is probable that at 25 or 30 m. p. h. the trouble is not so great. If this is the case, it shows the extra fuel is being used and it bears out this diagnosis. Look to the float level and probably you will find it punctured and, dropping through weight, it permits the float valve to remain open. If it is a metal float, it can be soldered, after the gasoline within has been removed; if of cork, it should be dried out in a slow oven, but so it cannot burn, and then it should be shellacked over. In all events the level must be set again.

Operation of Zenith Carburetor

Q—Illustrate the operation of the Zenith carburetor. In a 1918 Chevrolet 490 the carburetor leaks, also sputters and backfires when making a slight grade.—W. Wilson, Great Falls, Mont.

The Zenith carburetor is shown in Fig. 10. It is claimed this furnishes the correct mixture for perfect combustion at all engine speeds. The trouble with your carburetor may be due to the intake air being insufficiently heated, which of course is remedied by providing a more efficient stove. The mixture may be too lean, in which event a larger compensating jet should be used, I. It is best to try several jets and use the one which gives the best results. The choke tube may be too large, X. The remedy is a new choke tube with a smaller orifice, which will increase the gas velocity.

Carburetor Change on Chalmers

Q—Would it help to change the carburetor, or should I install one of the stock make? The car is a Chalmers 30.

2—Would you recommend heating the intake air by taking it in near the exhaust pipe or heating the manifold?—A. E. Reynolds, Mexico City, Mexico.

1—A newer and later carburetor would be better.

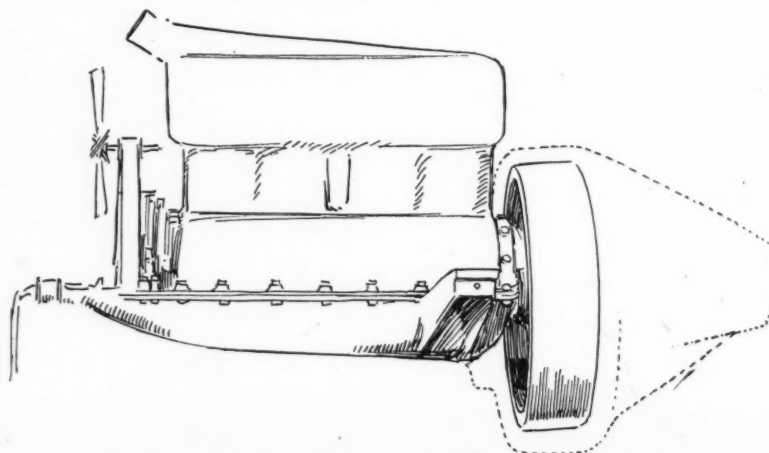


Fig. 9—Ford engine remodeled so as to have exposed flywheel

2—Yes, it is a good idea to heat the fuel or the mixture. In Fig. 11 is a manifold designed for your car. This has a hot plate at the top which will vaporize the heavier portions of fuel as they emerge from the carburetor and strike the hot spot. The hot exhaust gases can be led from the exhaust manifold by tapping in just beyond the fourth cylinder connection and inserting a spoon-shaped scoop that will deflect part of the gases, and then they can be piped to the hot spot with a flexible tube. The small pipe shown is the outlet for the hot gases. They can be directed out from under the engine.

Engines

Exposed Flywheel on Ford

Q—Can a Ford engine be remodeled so as to have an exposed flywheel?

2—Could this be done by cutting off the crankcase at the rear and brazing a piece onto it? Would this be practical? Illustrate.

3—Will the Craig-Hunt cylinder head fit a Metz?—Morgan Sherrod, Courtland, Ala.

1—We do not like to say that this cannot be done, but we cannot see where there would be any financial benefit in making the flywheel an exposed one, for the simple reason that the cost of the job would be greatly in excess of the cost of a suitable engine.

2—Yes, the crankcase can be cut off and a new lug can be brazed on. This will necessitate a new lubricating system for the engine, as the Ford engine lubrication depends upon the flywheel's motion. This is a very difficult thing to illustrate unless the whole is detailed in a mechanical drawing, but in Fig. 9 we show how it would appear when finished.

3—No, this cylinder will not fit a Metz engine.

Perfect Volumetric Efficiency?

Q—Have there been any models made of a motor car engine that will completely scavenge the cylinders? If so, publish same.

2—How many systems of sleeve-valve engines are made, and how do they work?

3—Would it be beneficial to have a four-wheel-brake system on motor cars?—P. A. Guiles, Abilene, Kan.

1—For the piston to completely scavenge the burnt gases it would have to rise to the very top of the combustion chamber, that is, the clearance volume of the piston would be zero and the compression pressure would be infinite in value. We know of no such engines.

2—There have been many systems of valve control tried, among which are the

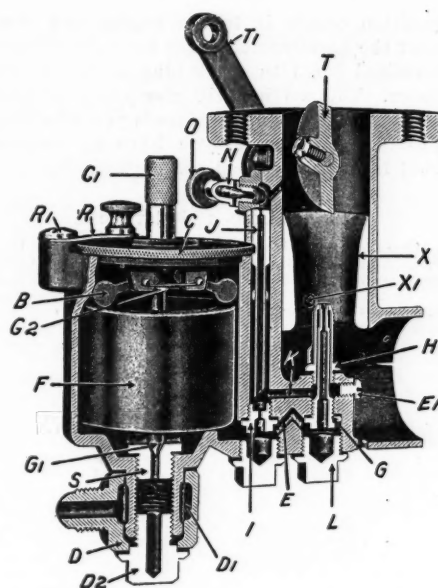


Fig. 10—Zenith carburetor, used to show operation

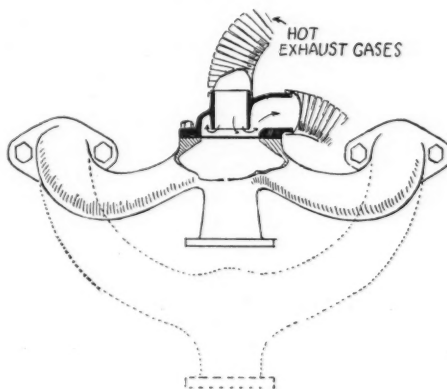


Fig. 11—Manifold designed for Chalmers

Knight sleeve-valve, in which the sleeves slide up and down. Then there is a rotary sleeve in which the sleeves oscillate. Some engines had a rotating tube in the head of the engine, which was a type of sleeve-valve. None of these, though, completely scavenged the burnt gases.

3—Four-wheel brakes would give quicker stopping action and would produce less strain on the car in so doing. But it is doubted if the extra cost would compensate for the advantage. A truck is a different proposition from a car, and to stop the

enormous weight four brakes become a necessity at times.

Probably Timed Wrong

Q—I had a Ford 1-ton truck with Maxfer attachment overhauled recently and since then it does not act quite right. When I advance the spark farther than one-third down the engine slows up with a dull knock or pound. It runs fine on the level and downhill, but it has no power on a grade on high gear. It seems to me it is timed too early.—Alfred Lobinger, Youngstown, Ohio.

Apparently you have the right solution, but it will be well to check up on the valve timing also if the timing gears were removed. This can be accomplished by removing the cylinder head and setting No. 1 piston at the top. The exhaust valve should begin to open when the piston is $3\frac{3}{8}$ in. from the top of the cylinder—not that distance of travel, however. If the timing gears were removed, they should be inspected to see that the gears are meshed at the punch marks on the faces of the gears. The exhaust valve should close when the piston is $\frac{1}{8}$ in. above the cylinder casting at top center. To correctly set the ignition timing place No. 1 piston at top dead center and then down $\frac{1}{8}$ in. Fully retard the spark lever under the steering wheel, that is, have it up as far as it will go. Now place the roller of the commutator on the No. 1 segment so it will just start to make contact with the segment. The firing order being 1-2-4-3, it will be well to see that the connections from the commutator terminals are made accordingly.

Piston Clearance

Moline, Ill., Editor MOTOR AGE—There seems to be considerable doubt among repairmen as to the correct amount of clearance to allow in fitting new pistons to the cylinders of the internal combustion engine as used on motor cars and tractors. Very recently the writer turned his motor car over to a garage for the purpose of having it overhauled, that is, have the cylinders ground and over-size pistons inserted. The engine was taken out and the cylinder block turned over to a local concern to do the grinding. The job was returned in the proper course of time and the garage mechanic found that an oversize piston could be used out of stock by lapping it to the proper size. The inside diameter of the cylinders were 3.887 in., having been ground 0.015 in. in oversize. I happened to drop into the place one day and found several mechanics grouped about my car and in a heated argument. Further investigation revealed that they were arguing over the proper piston clearance to be given the new pistons. One said 0.002 in., another 0.003 in. It was evident to me that they were guessing, and why they did not know the exact clearance to give seems mystifying to me since this particular garage overhauls quite a number of cars each season. I, however, soon settled the argument by informing them that my pistons were going to have, measured at the top of the pistons 0.001 in. clearance of each inch in diameter of the cylinder and below the third ring, that portion of the piston generally known as the skirt, was to have 0.0006 in. clearance for each inch in diameter of the cylinder.

This amount of clearance in the experience of the writer has proven to be sufficient to allow freedom of action of the pis-

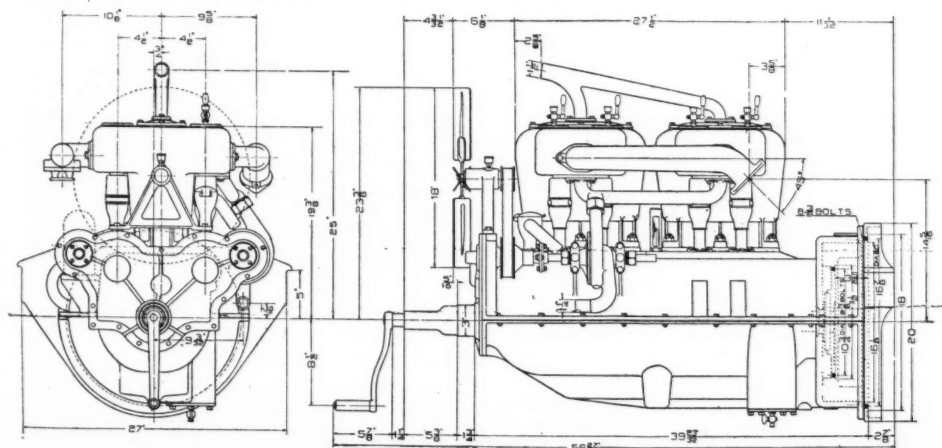


Fig. 12—Cross-section of Wisconsin engine used in Stutz

ton at all times and does not require as much block running as does tighter fits. It must be remembered that the piston and cylinder wall does not expand at exactly the same rate since the water jacket tends to remove the heat first from the cylinder and then from the piston by means of the intervening cylinder wall. The expansion of the cylinder wall tends to make the cylinder larger in diameter. However, this is partially neutralized by the cooler back metal causing, to some degree, unequal expansion. The piston, however, is not hindered by such excess metal but expands almost uniformly over the upper surface, the skirt only remaining comparatively cool.

Considerable trouble can be eliminated by the owner of the motor to bear this fact in mind when he has it overhauled next time and to demand that the exact figures representing the diameter of the cylinder bore and the upper as well as the lower diameter of the piston be written down as an immediate check on the mechanic's work and as a future aid in obtaining new rings in case such may become necessary. If you are familiar with micrometer reading this item can be checked at first hand but in case you are not you can remove the rings and slip the piston in the cylinder bore. The head end should then go in very easily and the skirt fit slightly tighter, then by leaving loose, the entire piston should fall slowly and gradually through the cylinder. If it does this it is very nearly right.—C. C. Hermann.

Engine Starts Hard

Q—I have a Ford that starts hard in the morning. After it has run 2 min. I can stop it, fill the radiator and then successfully crank by hand. I frequently have to have it towed a quarter-mile to get it started.—A. C. Nellis, Richey, Mont.

It is more than likely you open the throttle too much while starting; perhaps you do not use the choker as you should. Also perhaps you keep the spark retarded too much, but be careful not to advance it to the extent that you will get a back-kick. Your engine starts readily after it has been run a while because it has warmed up somewhat. If it continues to be obstinate, we would suggest putting in a set of priming plugs, so you can prime the engine, and then it ought to start easily. Possibly, too, you have the gas supply cut down too much.

Timing Maxwell Engine

Q—I have a 1915 Maxwell, Simms magneto and air friction carburetor. I have my spark set at dead center on retard position. Please advise at what degree advance on the flywheel the spark should be set for ordinary driving and for hard pulling at the following engine speeds: 150, 250, 450, 800, 1000 and 1500 r.p.m. I want the position for hard pulling that will give the most power and still be the coolest position for the engine.—C. M. Jones, Yakima, Wash.

To get the best all-around timing for this model proceed as follows: Turn the engine over by hand until the piston of No. 1 cylinder is on top dead center on the compression stroke. Turn the armature shaft of the magneto until figure 1 appears in the sight hole of the distributor, which indicates the distributor brush is in contact with No. 1 segment. Retard the timing lever and move the armature a little to the right or left so the platinum points just break or open. With the magneto in this

position couple it to the engine and connect the high-tension cable from distributor terminal No. 1 to spark plug in No. 1 cylinder. This setting will give you good performance at any of the speeds you mention, provided, of course, you have an engine that is in pretty good shape generally.

Engine Knocks Under Load

Q—I am unable to locate a knock in the engine of a 1916 Chevrolet 490. It is not very noticeable when the engine is warm and running 15 or 20 m.p.h. It is very noticeable when the engine is cold or warm. When I start out on low with four or five people in the car it makes a sort of rumbling and knocking sound, especially when I am just picking up the load with the clutch, but after it is under way on low gear or any gear it is not so noticeable. It is also very noticeable when the engine runs idle or speeding it up idle. I recently put in four new piston pins, ground the valves, cleaned out the carbon and tightened up the connecting rod bearings, just snug but not so hard that the crankshaft does not turn easily. I noticed a slight end play in the center crankshaft bearing $\frac{1}{8}$ to $\frac{1}{4}$ in. and wondered if this causes the knock. The car has been run about 7000 or 8000 miles and has had excellent care. The pistons and cylinders are in good condition and not scored in the least, has excellent compression, so I do not think it is a piston slap.—Theodore Stanke, Winona, Minn.

An engine that knocks when under load such as yours does indicate that there is a loose bearing or a piston slap. You say this noise resembles a rumble. If the noise is a heavy thud and occurs regularly when starting up, then it is probably a rear crankshaft bearing. If it is a dull, heavy thud but of more of a metallic nature, then it is in the front bearing. It very often happens that engines are rebored for piston slap when the cause is warped connecting rods.

Sizaire-Naudin Engine

Q—What was the bore and stroke of the Sizaire-Naudin long-stroke engine?
2—How many cylinders did it have?
3—Where were the valves located?

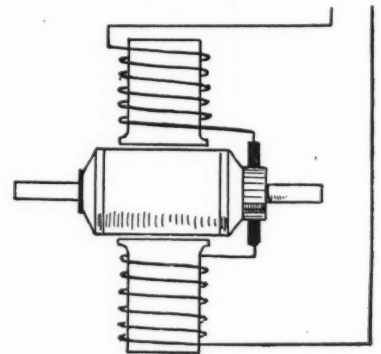
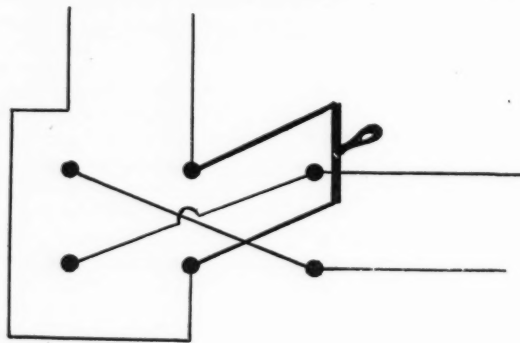


Fig. 13—Reverse switch, left, and typical generator

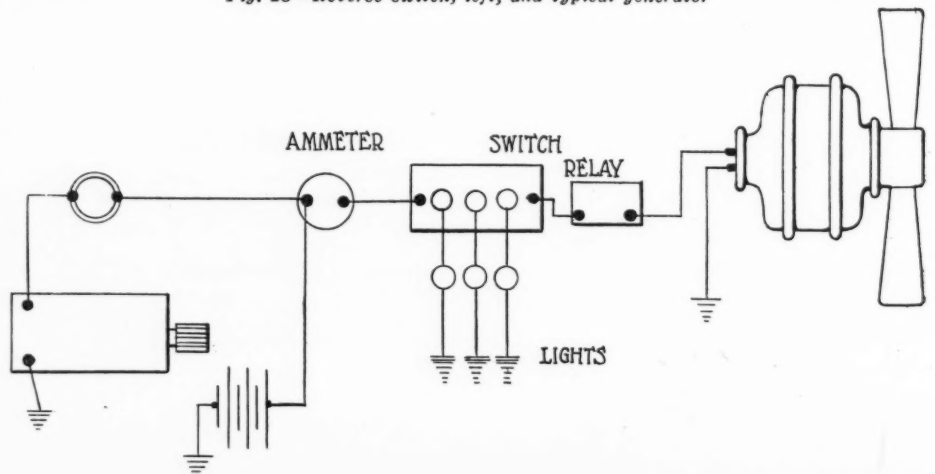


Fig. 14—Wiring diagram using Kemco generator

4—Did the engine in question drive a light car 100 m.p.h.?

5—Which side of a piston should the offset of the piston pin be placed in an engine running at 3400 r.p.m.?

6—Would 0.08 in. be too much on an engine 3.16 by 6.34 in.?—Pere Wickes, Port Royal, S. C.

1—2.75 by 6.69 in.

2—Four.

3—L-head type with valves on the left side.

4—The company built a racing car that was considered very fast, but we do not know it reached 100. Other technical information on this car is not available.

5—Looking at the engine from the front, the offset should be to the left, that is, the greater portion of the piston area should be on the right.

6—No, 0.08 in. is rather too much; $\frac{1}{8}$ in. is considered enough for engines up to $3\frac{1}{2}$ -in. bore.

The Electric System

Typical Generator and Armature

Q—Publish typical view of generator showing how field coils are placed and fastened on poles. Also windings of armature.

2—Why is a circuit breaker necessary in the primary circuit of a magneto when an alternating current, such as it gives, produces an inductive effect in the ignition coil?

3—Publish perspective view of Ford ignition, showing position of the different colored primary wires on the timer and coil.

4—Explain the operation of the reversing type switch. How is the current made to reverse its direction each time the switch is operated?—E. C. Metcalf, Waupun, Wis.

1—A typical generator is shown in Fig. 13.

2—The circuit breaker in the magneto is a pair of contacts that opens and short-circuits the primary winding. The primary circuit ordinarily is short-circuited, and at the instant the spark is to occur the con-

tacts open and the sudden rush of current builds up a counter current of high voltage in the secondary. There is not this intermittent effect in the coil unless a vibrator is used.

3—See page 44, Jan. 30 issue.

4—The principle of the reverse switch is illustrated in Fig. 13.

Switch in Oakland

Q—What do the letters "N.A.C.C." stand for?
2—How is horsepower figured?
3—An Oakland 32, 1916 model, equipped with a Remy system will start on only two points of the switch. Show drawing of the switch. How does it work?—Roy F. Himelick, Frederic, Iowa.

1—National Automobile Chamber of Commerce.

2—The N. A. C. C. formula is $\frac{D^2 \times N}{2.5}$ at

piston speed of 1000 feet a minute, where D equals bore.

N equals number of cylinders.

2.5 equals a constant.

3—The switch is shown in Fig. 15. The connections are very simple and should require no explanation.

Relay Burns Out

Q—The relay points on a model 4 Studebaker, 1914, are defective and will not work all of the time.—C. W. St. George, Dallas, Tex.

The trouble may be caused by one of the following: Carbon brushes in the generator having become worn or not fitting the commutator properly; lack of tension on the brush spring holders; commutator requiring cleaning up or undercutting the mica insulation between the copper segments. Loose wire connections at the generator relay and battery also would cause the failure of the relay points to close properly. The relay itself might be at fault.

Kemco Fan Generator

Q—Explain how to use a Kemco generator to charge a battery on a Ford. I have everything but the starter and would like to use battery for horn and lights and generator to charge battery. If this can be done, publish diagram.—Bethel Powell Browne, Henderson, Ky.

We believe you mean the Kemco fan belt generator developed for Fords. If so, replace the fan pulley with the generator. Connect according to the diagram in Fig. 14.

Locating Shorted Magneto

Trenton, Mo., Editor MOTOR AGE—If you ever have cause to repair a shorted Ford magneto this system will help you locate the shortest coil and also in 90 per cent of the cases repair it in a very short time.

Generally the coils on the upper side of the stationary magneto coil carrying members are the ones shorted, and it is a rare occurrence if more than is burned or shorted the same time.

The action of the rotating magnet carrying member throws the oil—impregnated with metallic dust or grindings—on the top of the coils. This oil settling and draining from the coils leaves iron particles which find their way down between the coils and the carrying member and thereby short the coil.

In testing for the shorted coil a 6-volt battery should be used, one pole connected to the binding post and the other pole used to find the shorted coil. This is done by making a connection with each coil until the shorted coil is found. After locating

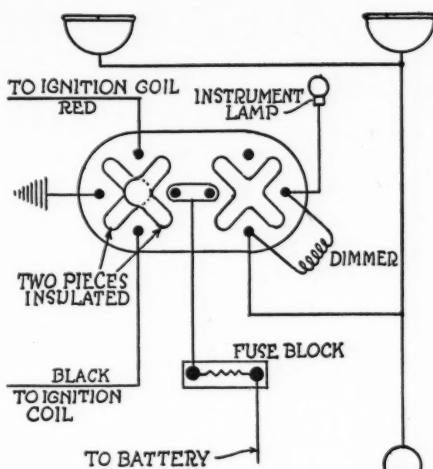


Fig. 15—Wiring of switch on Oakland

the one shorted take a tool—for instance, a knife blade—and work all the metallic sediment from the coil and from between the coil and the coil member.

After this is cleaned give the coil a coating of varnish and to hasten the drying take an ordinary trouble light and lay next to the coil treated. Give it several coats of varnish and let dry thoroughly and you will find the coil is O. K. This job requires removing the transmission cover head from the engine.—W. M. Wright.

Rebuilding

Engine in Juvenile Car

Q—Publish design of a juvenile car using a Flanders engine and 28-in. motorcycle wheels with seating room for two. Make it as low, short and narrow as possible.—Jack Walworth, Chippewa Falls, Wis.

Your Flanders engine is too heavy for a juvenile car with motorcycle wheels. A two-cylinder motorcycle engine would give you all the power necessary. In the races in California they develop upward of 60 m.p.h. with this type of car.

Speeding Up a Chalmers

Q—How can I get more speed out of an old Chalmers 30, model M, which has been converted into a two-seater? The ignition is high-tension Bosch magneto and the carburetor is the original Meyers.

2—Where can I obtain aluminite pistons to fit these cylinders?

3—Do you recommend them? Are they difficult to install?

4—Do you recommend aluminite connecting rods as well as the pistons?—A. E. Reynolds, Mexico City, Mexico.

1—It will be rather difficult for you to obtain parts ordinarily required to speed up a car, because Mexico City is a long way from distributing centers. The degree of speeding up you will be able to do will depend upon the facilities at your disposal. The rear axle might have the ratio reduced to 3 to 1, but this will cut down the available power so hilly districts will require greater use of the gearshift lever. The cylinders might be rebored to 4.25 in. in diameter and oversize pistons fitted. The valve ports also can be enlarged at the same time and larger valves installed. A new carburetor ought to be fitted, if nothing else is changed, for the 1911 carburetors were not designed to handle such low-grade fuels as are now on the market.

2—Lightweight pistons of aluminum or aluminum compounds can be obtained from

the Wridgway Co., Scranton, Pa.; Green Engineering Co., Fourth and St. Clair streets, Dayton, Ohio; Walker M. Levett Co., 417 E. Twenty-third street, New York.

Lightweight rods are made by the Green Engineering Co.

3—Lightweight pistons and rods certainly will reduce the vibrating forces within the engine and thus allow of higher speed. The greatest enemy to the engine is vibration, and if this can be cut down then the life of the engine will be lengthened and its operative speed will be increased.

4—See 3.

Advantage of Underslung

Q—Is there any advantage gained if a speedster is underslung?

2—Is it not better to have the same size wheels all around or back ones larger?—Bethel P. Browne, Henderson, Ky.

1—There are two meanings to the term underslung—one being where the rear springs are under the axle and the other where the frame is under the axles, as the American and Regal cars were made some years ago. No cars are made this way now. There would be an advantage in two directions, however. By having the frame set low there naturally would be less wind resistance, the center of gravity would be materially lowered, which would tend to prevent turning over readily, there would be slightly less swerving and consequently less wear on tires and it would be possible to have the driveshaft in a more direct line, thus avoiding the abrupt angle in transmitting power through the universal joints.

2—Theoretically it might be better to have the front tires smaller than the rear inasmuch as they have less work to do and, being lighter, they would offer less resistance in passing over obstructions; besides, they might tend to turn more easily. But it has come to be common practice to use the same size all around because of the inconvenience of having two sizes to carry, with two sizes of rims, etc. Nowadays it is necessary to carry only one size and this will fit any of the wheels. It calls for a smaller stock of spare tires and saves much inconvenience.

Overhauling Maxwell and R. C. H.

Q—Which of these two cars would be the best to overhaul and put in running order, a 1912 Maxwell Mascot or a 1915 R. C. H. roadster?

2—Which one would develop the best power and speed?

3—Which would be the cheapest when it comes to upkeep and gasoline?

4—What is the best speed of these when in perfect condition?—Reader, Galva, Ill.

1—This depends upon the condition of the cars. If one is badly in need of many repairs and new parts, then fix up the other one.

2—The R. C. H. car should develop the most speed and power, as it has a higher-speed engine, though slightly smaller than the Maxwell.

3—The R. C. H. will be the cheapest to run, as far as gasoline is concerned, having the smaller engine. The 1915 engine will be more efficient than the 1912 engine, because it was designed with the knowledge on hand that had been learned since the 1912 engine was designed.

4—We do not know the speeds of these cars, but the R. C. H. should prove the faster of the two.

Motor Age Monthly Passenger Car Specification Tables

These prices apply to five and seven-passenger models only—These tables are revised and brought up to date monthly

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Volts	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Allen 41	5	\$1195	112	32x33	optional	3 1/2x5	Ow	4	22.50	1-Zen.	Vacuum	B. and B.	Ow	Arac	Adams	Ditweiler	Stewart	Firestone	6	90	U. S. L.	A-L	A-L	Conn.	6	Allen 41
American B.	7	1865	122	32x4	Firestone	3 1/2x5	Ruten.	6	23.44	1-Zen.	Vacuum	B. and B.	G-L	Arac	Salisbury	Gemmer	V. Sicken	Firestone	6	100	Col.	West.	West.	A-K.	6	American B.
American Beauty 1	5	2000	121	32x43	optional	3 1/2x5	Ruten.	6	23.44	1 1/2-Ray.	Vacuum	B. and B.	Warner	Arac	Timken	Warner	Warner	Firestone	6	100	Willard	G. & D.	G. & D.	Remy	6	American Beauty 1
Anderson 400-A.	7	1750	120	32x4	optional	3 1/2x5	Cont.	6	25.35	1-Zen.	Vacuum	B. and B.	Durston	Arac	Col.	Jacox	Stewart	Firestone	6	80	Willard	West.	West.	Conn.	6	Anderson 400-A.
Apperson 8-18	7	4000	130	32x43	optional	3 1/2x5	Ow	8	33.50	John.	Vacuum	B. and B.	Ow	Sterling	Ow	Ow	V. Sicken	Firestone	6	90	Willard	Bijur	Bijur	Remy	6	Apperson 8-18
Auburn 6-30-H.	5	1595	120	32x4	Goodrich	3 1/2x5	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	G-L	Hart.	Col.	Jacox	Stewart	Firestone	6	80	Willard	Remy	Remy	Remy	6	Auburn 6-30-H.
Austin 12	6	4250	142	32x43	Goodrich	2 7/8x5	Weid.	12	39.08	1 1/2-Strom.	Vacuum	B. and B.	Muncie	Spicer	Austin	Lavine	Warner	Firestone	6	90	Willard	Delco	Delco	Delco	6	Austin 12
Biddle H.	4	2750	121	32x4	optional	3 1/2x5	Buda	4	22.50	1 1/2-Zen.	Vacuum	Warner	Warner	Spicer	American	Gemmer	Warner	Firestone	6	90	Willard	G. & D.	G. & D.	Eise.	6	Biddle H.
Brewster	5	7700	125	32x43	Kelly-S.	4 x5 1/2	Ow	4	25.60	Zen.	Vacuum	Ow	Ow	Spicer	Ow	Ow	Stewart	Perf-Jack.	6	80	U. S. L.	U. S. L.	U. S. L.	Bosch	6	Brewster
Briscoe 4-24	5	885	104	30x33	optional	3 1/2x5 1/2	Ow	4	15.20	1-Buick	Gravity	Ow	Ow	Ow	Ow	Ow	Stewart	Perf-Jack.	6	60	U. S. L.	Delco	Delco	Delco	6	Briscoe 4-24
Buick H-45	5	1495	118	32x4	Goodyear	3 1/2x5 1/2	Ow	6	27.34	Mar.	Vacuum	Ow	Ow	Ow	Ow	Ow	Stewart	Ow	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-45
Buick H-49	7	1785	124	32x43	Goodyear	3 1/2x5 1/2	Ow	6	27.34	Mar.	Vacuum	Ow	Ow	Ow	Ow	Ow	Stewart	Ow	6	60	U. S. L.	Delco	Delco	Delco	6	Buick H-49
Cadillac 57	7	3220	125	32x5	optional	3 1/2x5 1/2	Ow	8	31.25	1 1/2-Ow.	Pressure	Ow	Ow	Spicer	C-Timk.	Ow	V. Sicken	Kelley	6	117 1/2	Willard	Delco	Delco	Delco	6-3	Cadillac 57
Campbell C-4	5	835	110	30x33	Goodyear	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	G-L	Stanwell	Salisbury	Ow	Stewart	Stanwell	6	93	Willard	West.	West.	A-K.	6	Campbell C-4
Case U.	7	1565	117	32x4	optional	3 1/2x5 1/2	Ow	6	25.35	1 1/2-Strom.	Vacuum	B. and B.	Ow	Mechanics	Timken	Ow	Stewart	Kelley	6	100	Willard	West.	West.	Remy	6	Case U.
Chalmers 35-C	7	1795	123	32x4	optional	3 1/2x5 1/2	Ow	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	Ow	Hartford	Ow	Gemmer	Stewart	Firestone	6	100	Willard	West.	West.	Remy	6	Chalmers 35-C
Chandler	5	735	102	30x33	Goodyear	3 1/2x5	Ow	4	21.76	1 1/2-Zen.	Gravity	Ow	Ow	Ow	Ow	Warner	Stewart	Perf-Jack.	6	100	Willard	West.	West.	Bosch	6	Chandler
Chevrolet 4-40	5	1045	108	32x33	Goodyear	3 1/2x5 1/2	Ow	4	21.76	1 1/2-Zen.	Vacuum	Ow	Ow	Ow	Ow	Warner	Stewart	Perf-Jack.	6	100	Willard	West.	West.	Will.	6	Chevrolet 4-40
Chevrolet F.A. 5 and 2	5	1135	110	32x4	Goodyear	3 1/2x5 1/2	Ow	4	21.76	1 1/2-Zen.	Vacuum	Ow	Ow	Ow	Ow	Warner	Stewart	Perf-Jack.	6	100	Willard	West.	West.	Will.	6	Chevrolet F.A. 5 and 2
Chevrolet F.B.	5	2995	127	32x5	Goodyear	3 1/2x5 1/2	North.	8	39.20	1 1/2-Strom.	Vacuum	North.	North.	Spicer	Col.	Gemmer	Stewart	Kelley	6	50	Prent.	Delco	Delco	Delco	6	Chevrolet F.B.
Cole Aero Eight 870	5	115	115	32x4	Firestone	3 1/2x5 1/2	Cont.	6	25.35	1-Strom.	Vacuum	B. and B.	B.	Spicer	Timken	Gemmer	Stewart	Firestone	6	75	Willard	Dyn.	Dyn.	A-K.	6	Cole Aero Eight 870
Columbia CD and CS.	5	1695	125	32x4	Goodyear	3 1/2x5 1/2	Cont.	6	29.40	1 1/2-Ray.	Vacuum	B. and B.	B.	Spicer	Timken	Gemmer	Stewart	Firestone	6	80	Willard	Dyn.	Dyn.	A-K.	6	Columbia CD and CS.
Comet C-51	5	1195	115	32x33	Goodyear	3 1/2x5	Lyco.	4	19.60	1-Carter	Vacuum	B. and B.	Mechanics	Mechanics	Peru	Ditweiler	V. Sicken	Stanwell	6	80	Willard	Dyn.	Dyn.	A-K.	6	Comet C-51
Commonwealth 4-40	5	1495	118	32x4	Goodyear	3 1/2x5 1/2	Lyco.	4	19.60	1-Carter	Vacuum	B. and B.	Mechanics	Mechanics	Peru	Ditweiler	V. Sicken	Stanwell	6	80	Willard	Dyn.	Dyn.	A-K.	6	Commonwealth 4-40
Commonwealth 6-50	6	1095	115	32x33	Goodyear	3 1/2x5 1/2	Gray	4	19.60	1-Zen.	Vacuum	B. and B.	B.	Spicer	Peru	Ditweiler	V. Sicken	Stanwell	6	100	Willard	Dyn.	Dyn.	A-K.	6	Commonwealth 6-50
Crow-Elkhart K-36	5	1295	116	32x33	Firestone	3 1/2x5	Revten.	4	45.00	1 1/2-Strom.	Vacuum	B. and B.	B.	Spicer	Peru	Ditweiler	V. Sicken	Stanwell	6	120	Willard	West.	West.	Delco	6	Crow-Elkhart K-36
Crow-Elkhart K-46	5	1295	116	32x33	Firestone	3 1/2x5	Revten.	4	45.00	1 1/2-Strom.	Vacuum	B. and B.	B.	Spicer	Peru	Ditweiler	V. Sicken	Stanwell	6	120	Willard	West.	West.	Delco	6	Crow-Elkhart K-46
Cunningham V-3	7	3750	127	32x43	optional	3 1/2x5	H-S	8	33.80	1-Zen.	Vacuum	B-L	B-L	Spicer	Timken	Gemmer	Stewart	Firestone	6	100	Willard	West.	West.	Delco	6	Cunningham V-3
Daniels B.	7	2050	124	32x43	optional	3 1/2x5 1/2	Cont.	6	29.40	Strom.	Vacuum	B. and B.	Warner	Spicer	Timken	Gemmer	Stewart	Firestone	6	100	Willard	West.	West.	Delco	6	Daniels B.
Davis J.	7	1895	119	32x4	optional	3 1/2x5 1/2	Cont.	6	25.35	Strom.	Vacuum	B. and B.	Warner	Spicer	Timken	Gemmer	Stewart	Firestone	6	100	Willard	West.	West.	Delco	6	Davis J.
Dixie Flyer L.	5	1095	112	32x33	Goodyear	3 1/2x5	Lyco.	4	16.90	1-Carter	Vacuum	B. and B.	G-L	Ow	Peru	C. A. S.	V. Sicken	Firestone	6	60	Willard	Dyn.	Dyn.	Conn.	6-3	Dixie Flyer L.
Dodge Brothers	5	1085	114	32x33	optional	3 1/2x5 1/2	Ow	4	24.03	1-Stew.	Vacuum	Ow	Ow	Ow	Ow	Ow	J. Mar.	Firestone	12	115	Willard	N. E.	N. E.	Boch	6	Dodge Brothers
Dorris 6-80	7	3500	132	32x5	optional	3 1/2x5 1/2	Ow	6	38.40	1 1/2-Strom.	Vacuum	B-L	Ow	Spicer	Timken	Warner	V. Sicken	Firestone	6	85	Willard	West.	West.	Boch	6	Dorris 6-80
Dort 11	5	925	105 1/2	30x33	Goodyear	3 1/2x5	D-Lyco.	4	19.60	1-Carter	Gravity	Ow	Ow	Mechanics	W-Weis	Jacox	Stewart	Jackson	6	85	Willard	West.	West.	Conn.	6	Dort 11
Elcar	5	1175	116	32x33	Firestone	3 1/2x5	Lyco.	4	19.60	1-Carter	Vacuum	Mechanics	Mechanics	Mechanics	Salisbury	Foster	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	A-K.	6	Elcar
Elcar	5	1375	116	32x4	Firestone	3 1/2x5 1/2	Cont.	6	25.35	1 1/2-Strom.	Vacuum	B. and B.	B.	Muncie	Salisbury	Foster	Stewart	Firestone	6	90	Willard	Dyn.	Dyn.	A-K.	6	Elcar
Elgin Series H	5	1395	118	32x4	optional	3 1/2x5 1/2	Falls	6	23.44	1-Strom.	Vacuum	B. and B.	Mechanics	Mechanics	Adams	C. A. S.	V. Sicken	Firestone	6	90	Willard	Wagner	Wagner	Delco	6	Elgin Series H
Eseer A.	5	1395	108 1/2	32x4	optional	3 1/2x5	Ow	4	18.23	Ow	Vacuum	Ow	Ow	Spicer	Timken	Ow	Stewart	Firestone	6	105	Willard	Delco	Delco	Delco	6	Eseer A.
Ford T.	5	525	100	30x33	optional	3 1/2x4	Ow	4	22.50	H-K	Gravity	Ow	Ow	Ow	Ow	Ow	Ow	Firestone	12	50	Willard	Dyn.	Dyn.	A-K.	12	Ford T.
Franklin 9	5	2450	115	32x43	Goodyear	3 1/2x4	Ow	6	25.35	1-Ow	Vacuum	B. and B.	Ow	Ow	Ow	Ow	Ow	Firestone	12	50	Willard	Dyn.	Dyn.	A-K.	12	Franklin 9

Engines—Rutenber; Cont., Continental; Weid., Weidely; North., Northway; H.S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Belknap & Swartz; T-McF., Teeter-McFarlan; S., Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetors—Strom, Stromberg; Zen., Zenith; Ray, Rayfield; John, Johnson; Mar., Marvel; Sund., Sundman; Sev., Stewart; H-K., Holley-Kingston; Newt., Newcomb; Schab., Schaefer; Tiltot., Tiltotson; Johns., Johnston. Generator and Motor—A-L, Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L, Ward Leonard; Dyn., Dyneto; N. E., North East; L-N, Leeco-Neville; A-C, Allis-Chalmers; Split., Splitdorf; S-N, Summa-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise., Eiseeman; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W, Bosch-Westinghouse; Split., Splitdorf. Gearset—G-L, Grant-Lee; North., Northway; B-L, Brown-Lipe. Rear Axle—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man., John-Mansville; V-Sicken, Van Sicken.

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. H. P.	Carburetor Make and Size	Fuel Feed	Clutch	Gearset	Universals	Rear Axle	Steering Gear	Speedometer	Rims	Battery Vols	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model	
Geronimo.....	7	1505 122	32x4	Goodyear 31x35	Ruten.	31x35	Ruten.	6	23.44	1-Stron.	Vacuum	B. and B.	G-L.	Hart.	W-Weiss	C. A. S.	Stewart	Firestone	6	88	Willard	Dyn.	Delco	Delco	6	Geronimo.	
Glide 6-40.....	5	1655 119	34x4	Goodyear 31x35	Ruten.	31x35	Ruten.	6	23.44	1-Ray.	Vacuum	Own	Own	Spicer	American	Ditweiler	Stewart	Goodyear	6	80	Willard	West.	West.	6	Glide 6-40.		
Grant.....	5	1120 114	32x3 1/2	.....	Own	3x4 1/4	Own	4	21.60	Strom.	Vacuum	Durston	Durston	Mechanics	Peru	Jacob	V. S. Sicken	Stanwell	6	90	Willard	Wagner	Remy	6	Grant.	
Harroun.....	5	905 106	30x3 1/2	.....	Own	31x35 1/2	Own	4	16.90	1-Stron.	Vacuum	Own	Mechanics	Own	Adams	Gemmer	Stewart	Stanwell	6	80	Willard	Remy	A-K.	6-3	Harroun.	
Harvard 4-20.....	2	850 100	28x3	.....	3x4 1/4	3x4 1/4	3x4 1/4	4	14.40	3/4-Zen.	Gravity	.....	.....	Blood	.....	Barnes	.....	.....	6	.....	National	Wagner	A-K.	6-3	Harvard 4-20.
Hatfield A.....	5	1180 115	32x4	Firestone	G. B. & S.	31x35 1/2	G. B. & S.	4	22.50	1-Zen.	Vacuum	G. B. & S.	G-L.	Spicer	Peru	Barnes	.....	.....	6	100	Willard	Dyn.	Conn.	6	Hatfield A.
Haynes 46.....	7	3250 127	34x4 1/2	optional	29x35	31x35	Own	12	36.30	Ray.	Vacuum	B. and B.	Own	Own	Own	Jacob	Stewart	Firestone	6	120	Willard	L-N.	Conn.	6	Haynes 46.		
Haynes 45.....	7	2485 127	34x4 1/2	optional	29x35	31x35	Own	6	29.40	1-Ray.	Vacuum	B. and B.	Own	Own	Own	Jacob	Stewart	Firestone	6	120	Willard	L-N.	Ki-Rem	6	Haynes 45.		
Hollier 206.....	5	1595 116	32x4	Goodyear 31x35 1/2	Cont.	31x35 1/2	Cont.	6	25.35	Stew.	Vacuum	Own	Own	Own	Own	Own	Gemmer	Stewart	Firestone	6	50	Gould	A-C.	Ren-7	6	Hollier 206.	
Hollier 198.....	5	1695 116	34x4	Goodyear 31x35 1/2	Own	31x35 1/2	Own	8	33.80	Stew.	Vacuum	Own	Own	Own	Own	Own	Gemmer	Stewart	Firestone	6	50	Gould	A-C.	Ren-7	6	Hollier 198.	
Holmes.....	7	2900 126	34x4 1/2	Goodyear 31x35 1/2	Own	31x35 1/2	Own	6	29.40	1-Newe.	Vacuum	B-L	B-L	Spicer	Timk.	Gemmer	V. S. Elgin	.....	12	100	Col.	Dyn.	Eise.	12-6	Holmes.	
Hudson M.....	7	2200 125	35x4 1/2	optional	31x35 1/2	31x35 1/2	Own	6	29.40	1-Ray.	Vacuum	Own	Own	Spicer	Timken	Gemmer	Stewart	Kelsey	6	.....	Exide	Delco	Delco	6	Hudson M.	
Hupmobile R.....	5	1335 112	32x4	Goodyear 31x35 1/2	Own	31x35 1/2	Own	4	16.90	1-Ray.	Vacuum	Own	Own	Own	Detroit	Jacob	Gemmer	V. S. Sicken	6	87 1/2	Willard	West.	A-K.	6	Hupmobile R.		
Jackson.....	5	118 37x4	.....	.....	3x3 1/2	3x3 1/2	.....	8	28.80	Zen.	Vacuum	B. and B.	Covert	.....	Salisbury	Foster	Stewart	.....	6	.....	.....	A-L.	.....	6	Jackson.
Jones.....	7	2100 126	34x4	Goodyear 31x35 1/2	Cont.	31x35 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	B-L	Arvae	Timken	Warner	Stewart	Firestone	6	120	Prest.	West.	Remy	6	Jones.		
Jordan.....	7	2475 127	32x4	U. S.	31x35 1/2	31x35 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	Detroit	Sterling	Timken	Gemmer	Stewart	Firestone	6	109.8	Willard	Bijur	Delco	6	Jordan.		
King G.....	7	2150 120	34x4	Firestone	3x5	3x5	Own	8	28.80	1-Ray.	Vacuum	B. and B.	Own	Spicer	Col.	Jacob	Stewart	Stanwell	6	117.5	Willard	Bijur	A-K.	6	King G.		
Kissel Kar.....	5-7	2550 124	32x4 1/2	Goodyear 31x35 1/2	Own	31x35 1/2	Own	6	26.30	1-Ray.	Vacuum	Warner	Warner	Spicer	Own	Jacob	Stewart	Firestone	6	90	Willard	Remy	Remy	6	Kissel Kar.		
Kline Kar 6-42.....	5	1865 121	33x4	Goodyear 31x35 1/2	Cont.	31x35 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	G-L	.....	Hess	Wohlbab	Stewart	Firestone	6	90	Prest.	West.	Conn.	6	Kline Kar 6-42.	
Lexington R-19.....	5-7	1785 122	32x4	Goodyear 31x35 1/2	Cont.	31x35 1/2	Cont.	6	25.35	1-Ray.	Vacuum	B. and B.	Warner	Hardy	Hess	Warner	Stewart	Goodrich	6	100	Willard	West.	Conn.	6	Lexington R-19.		
Liberty 10-B.....	5	1570 115	32x4	Goodyear 31x35 1/2	Cont.	31x35 1/2	Cont.	6	25.35	1-Stron.	Vacuum	B. and B.	Detroit	Spicer	Timken	Jacob	Stewart	Firestone	6	88	Willard	Delco	Delco	6	Liberty 10-B.		
Locomobile 48.....	7	142 35x5	.....	.....	41x51 1/2	41x51 1/2	Own	6	48.60	Own	Pressure	Own	Own	Own	Own	Own	Stewart	Firestone	6	120	Willard	West.	West.	6	Locomobile 48.
Maibohm B.....	5	1290 116	32x3 1/2	optional	31x35 1/2	31x35 1/2	Falls	6	23.44	1-Stron.	Vacuum	B. and B.	Mechanics	.....	Peru	Jacob	Stewart	Stanwell	6	80	Willard	Wagner	A-K.	6	Maibohm B.	
Marmion 34.....	7	3950 136	32x4 1/2	.....	31x35 1/2	31x35 1/2	Own	6	33.75	Strom.	Gravity	Own	Own	Spicer	Own	Gemmer	Stewart	.....	6	120	Prest.	Bijur	Bosch	6	Marmion 34.
Maxwell 25.....	5	895 109	30x3 1/2	U. S.	39x35 1/2	39x35 1/2	Own	4	21.03	1-John.	Vacuum	Own	Own	Own	Own	Own	Warner	Kelsey	12	35	Prest.	S-H.	A-K.	12	Maxwell 25.		
McFarlan 127.....	7	4300 136	35x5	optional	41x56	41x56	T-McF.	6	48.60	1-Ray.	Vacuum	B. and B.	B-L	Spicer	Timken	Gemmer	Stewart	Firestone	6	120	Willard	West.	West.	6	McFarlan 127.		
Mercer Series 4.....	6	4500 132	32x4 1/2	optional	31x35 1/2	31x35 1/2	Own	4	22.50	1-Ray.	Vacuum	Own	Own	Spicer	Own	Gemmer	Warner	.....	6	120	Willard	West.	West.	6	Mercer Series 4.	
Mitchell C-42.....	7	1525 127	32x4	.....	31x35	31x35	Own	4	22.50	1-Ray.	Vacuum	Own	Own	Spicer	Own	Own	Warner	.....	6	100	Willard	Remy	Remy	6	Mitchell C-42.
Mitchell D-40.....	5	1275 120	32x4	.....	31x35	31x35	Own	6	25.35	1-Ray.	Vacuum	Own	Own	Spicer	Own	Own	Warner	.....	6	100	Willard	Remy	Remy	6	Mitchell D-40.
Moine-Knight L.....	5	2000 117	34x4	optional	31x35	31x35	Own	4	22.50	1-Ray.	Vacuum	B. and B.	Warner	Spicer	Timken	Jacob	Stewart	Firestone	6	117	Willard	Wagner	A-L.	6	Moine-Knight L.		
Moine-Knight G.....	7	2500 122	35x4 1/2	optional	4x6	4x6	Own	4	25.60	1-Ray.	Vacuum	Own	Warner	Spicer	Timken	Jacob	Stewart	Firestone	6	117	Willard	Wagner	A-L.	6	Moine-Knight G.		
Monitor, M. & O.....	5	1475 117	33x4	Firestone	31x35 1/2	31x35 1/2	Cont.	6	29.40	1-Stron.	Vacuum	B. and B.	G-L	.....	Adams	C. A. S.	Stewart	Goodrich	6	88	Willard	Dyn.	Conn.	6	Monitor, M. & O.	
Moon 6-66.....	7	2500 125	35x4 1/2	Miller	31x35 1/2	31x35 1/2	Cont.	6	29.40	1-Ray.	Vacuum	B. and B.	Warner	Arvae	Timken	Warner	Stewart	Firestone	6	110	Exide	Delco	Delco	6	Moon 6-66.		
Moon 6-36.....	5	1485 114	32x3 1/2	Miller	27x34 1/2	27x34 1/2	Cont.	6	19.84	1-Tillot.	Gravity	Own	Own	Spicer	Own	Warner	Stewart	Firestone	6	80	Exide	Wagner	Delco	6	Moon 6-36.		
Moore 30.....	5	850 106	30x3 1/2	Firestone	31x35 1/2	31x35 1/2	G. B. & S.	4	22.50	1-K. D.	Gravity	.....	G-L	.....	Peru	.....	Stewart	.....	6	80	Willard	A-L.	A-L.	6	Moore 30.
Nash 681.....	5	1490 121	33x4	optional	31x35 1/2	31x35 1/2	Own	6	25.35	1-Ray.	Vacuum	B. and B.	Own	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	6	Nash 681.	
Nash 682.....	7	1690 127	34x4 1/2	optional	31x35 1/2	31x35 1/2	Own	6	25.35	1-Ray.	Vacuum	B. and B.	Own	Own	Own	Own	Gemmer	Stewart	Firestone	6	100	Willard	Delco	Delco	6	Nash 682.	
National 6.....	7	2450 128	34x4 1/2	optional	31x35 1/2	31x35 1/2	Cont.	6	29.40	1-Ray.	Vacuum	Own	Muncie	.....	Col.	Warner	Warner	Firestone	6	110	Prest.	West.	West.	6	National 6.	
National 12.....	7	3050 128	34x4 1/2	optional	27x34 1/2	27x34 1/2	Own	12	39.68	1-Ray.	Vacuum	Own	Own	Spicer	Col.	Warner	Warner	Firestone	6	110	Prest.	Bijur	Delco	6	National 12.		
Oakland 34-B.....	5	1185 112	32x4	Goodyear 24x34 1/2	Own	24x34 1/2	Own	6	18.99	1-Mar.	Vacuum	North.	Warner	Mechanics	West-Mott	Jacob	Stewart	Perman	6	85	Prest.	Remy	Remy	6	Oakland 34-B.		
Oldsmobile 37-A.....	5	1295 112	32x4	Goodyear 24x34 1/2	North.	24x34 1/2	North.	6	18.99	1-John.	Vacuum	North.	Warner	.....	West-Mott	Jacob	Stewart	Perman	6	80	U. S. L.	Remy	Remy	6	Oldsmobile 37-A.	
Oldsmobile 45-A.....	7	1700 120	34x4	Goodyear 27x34 1/2	Own	27x34 1/2	Own	8	26.45	1-Ray.	Vacuum	Own	North.	.....	West-Mott	Jacob	Stewart	Perman	6	100	Exide	Delco	Delco	6	Oldsmobile 45-A.	
Olympian 45.....	5	1240 112	32x3 1/2	Miller	31x34 1/2	31x34 1/2	Own	4	16.90	1-Ray.	Vacuum	B. and B.	Own	Own	Own	Warner	Stewart	Perman	6	75	U. S. L.	A-L.	A-L.	6	Olympian 45.		
Overland 90.....	5	985 106	31x4	.....	39x35	39x35	Own	4	18.23	1-Tillot.	Vacuum	Own	Own	Own	Own	Own	Stewart	Stanwell	6	80	Willard	A-L.	A-L.	6	Overland 90.	
Engines—Ruten. Rutenber; Continental; Weid. Weidely; North. Northway; H-S. Herschel-Spillman; Lyco. Lycoming; D-Lyco. Dort-Lycoming; G. B. & S. S. S. Tector-McFarlan; M. Monson or Duesenberg; R. & V. Root & Van Dervoort. Carburetor—Strom. Stromberg; Zen. Zenith; Ray. Rayfield; John. Johnson; Mar. Marvel; Sund. Sundeman; Stew. Stewart; H-K. Holley-Kingston; Newcomb; Schel. Schaebler; Tillotson; Johns. Johnston. Generator and Motor—A-L. Auto-Lite; West. Westinghouse; W. Westinghouse or Auto-Lite; W-L. Ward Leonard; Dyn. Dynetor; N. E. North East; L-N. Leeco-Neville; A-C. Allis-Chalmers; Split. Splitdorf; S-N. Simma-Huff; G. & D. Gray & Davis. Ignition—A-K. Atwater-Kent; Conn. Connecticut; Eise. Eisemann; West. Westinghouse; Will. Willard; N. E. North East; K-Remy. Kingston-Remy; Berl. Berling; Bosch-W. Bosch-Westinghouse; Split. Splitdorf. Gearset—G-L. Grant-Lees; North. Northway; B-L. Brown-Bole. Columbian; W. Weiss. Walker-Weiss; C-Tink. Cadillac-Lucas; Universal Machine Co. Speedometer—J-Man. John-MacLe; V-Sicken. Van Sicken.																											

Engines—Ruten., Rutenberg; Cont., Continental; Weid., Weidely; North., Northway; H-S., Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Bellnap & Swartz; T-McF., Teeter-McFarlan; #, Monson or Duesenberg; R. & V., Root & Van Dervoort. Carburetor—Strom, Stromberg; Zen., Zenith; Ray, Rayfield; John, Johnson; Mar., Marvel; Lynd., Lyndon; S., Sunderman; Stew., Stewart; H-K., Holley-Kingston; Newe., Newcomb; Scheb., Schelberg; Tillot., Tillotson; Johns., Johnston. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise., Eismann; West., Westinghouse; Will., Willard; N. E., North East; L-N, Lees-Neville; A-C, Allis-Chalmers; Split., Splitdorf; S-N, Simma-Huff; G. & D., Gray & Davis. Gearset—G-L, Grant-Lee; North., Northway; B-L, Brown-Lire. Rear Axle—Col. Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man., John-Manville; V-Sicken, Van Sicken.

Motor Age Monthly Passenger Car Specification Tables—Concluded

Name and Model	Seating Capacity	Price	Wheelbase	Rear Tire Size	Make of Tire	Bore and Stroke	Engine Make	No. Cylinders	N. A. C. C. HP.	Carburetor Make and Size	Fuel Feed	Clutch	Gearbox	Universal	Rear Axle	Steering Gear	Speedometer	Rims	Battery Amp.	Battery Make	Generator Make	Motor Make	Ignition Make	Lamp Voltages	Name and Model
Owen Magnetic O-36.	7	4200	135x5	35x5	Optional	3 1/2 x 5 1/2	Buda	6	25 35	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	24	Willard	Own	Own	Bosch	24	Owen Magnetic O-36.
Owen-Magnetic, W-42.	7	5500	142	35x5 1/2	Optional	4 x 5 1/2	Weid.	6	38 40	Zen.	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	28	Willard	Own	Own	Bosch	28	Owen-Magnetic, W-42.
Packard 3-25.	7	4800	35x5	35x5	Goodyear	3x5	Own	12	43 20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	Willard	Bijur	Bijur	Delco	7	Packard 3-25.
Packard 3-35.	7	5150	35x5	35x5	Goodyear	3x5	Own	12	43 20	Own	Pressure	Own	Own	Spicer	Own	Own	Waltham	Firestone	6	Willard	Bijur	Bijur	Delco	7	Packard 3-35.
Paige 6-55.	7	2060	127	34x4 1/2	optional	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/4 - Ray.	Vacuum	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Keley	6	Willard	Remy	Remy	Delco	6	Paige 6-55.
Paterson 6-46.	7	1555	117	33x4	optional	3 1/2 x 5	Ruten.	6	23 44	1 - Strum.	Gravity	B. and B.	Own	Spicer	Salisbury	Jacox	Stewart	Keley	6	Willard	Remy	Remy	Delco	6	Paterson 6-46.
Peerless Series 4.	7	1625	120	33x4	Goodyear	3 1/2 x 5	Cont.	6	25 35	1 1/2 - Strum.	Vacuum	B. and B.	Own	Spicer	Timken	Own	Stewart	Firestone	12	Willard	A-L.	A-L.	A-K.	6	Peerless Series 4.
Phiatra R.	7	2760	125	34x4 1/2	Goodyear	3 1/2 x 5	Own	8	33 80	Ball	Vacuum	Own	Own	Spicer	Amer.	Own	Warner	Firestone	6	Willard	W-L.	W-L.	Bosch	6	Phiatra R.
Piedmont 6-40.	5	5000	125	32x4 1/2	U. S.	3 1/2 x 5 1/2	Own	4	19 60	Carter	Vacuum	B. and B.	Own	Spicer	Timken	Own	Stewart	Firestone	6	Willard	Remy	Remy	Delco	6	Piedmont 6-40.
Pierce-Arrow 48.	7	1545	120	32x4	Goodyear	4 1/2 x 5 1/2	Cont.	6	25 35	Zen.	Pressure	Own	Own	Spicer	Own	Own	Stewart	Goodrich	6-8 135	Prent.	Delco	Delco	Delco	6	Pierce-Arrow 48.
Plot.	7	6500	142	35x5	Goodyear	4 1/2 x 5 1/2	Own	6	48 60	Own	Vacuum	B. and B.	Own	Hart.	Own	Own	Stewart	Goodrich	6	Prent.	Delco	Delco	Delco	6	Plot.
Premier 6-C.	7	2585	126	32x4 1/2	Firestone	3 1/2 x 5 1/2	Own	6	27 34	1 1/4 - Johns.	Vacuum	B. and B.	Own	Spicer	Timken	Own	Warner	Firestone	6	Willard	Delco	Delco	Delco	6	Premier 6-C.
Reo T.	5	1205	120	34x4	U. S.	4 1/2 x 5 1/2	Own	4	27 23	1 - John.	Vacuum	Own	Own	Own	Own	Own	Stewart	Firestone	6	Willard	Remy	Remy	Delco	6	Reo T.
Revere.	7	285	131	32x4 1/2	optional	4 1/2 x 6	#	6	30 63	1 1/4 - Strum.	Vacuum	B-L	Own	Own	Tim-Ball	Own	Stewart	Hook	6	Willard	West.	West.	Bosch	6	Revere.
Roamer 6-54.	7	1125	128	32x4 1/2	Goodyear	3 1/2 x 5 1/2	Cont.	6	29 40	1 1/4 - Strum.	Vacuum	B. and B.	Own	Arvac	Own	Own	Warner	Hayes	6	Col.	Bijur	Bijur	Bosch	6	Roamer 6-54.
Saxon Y-18.	5	1155	112	32x3 1/2	Goodyear	2 7/8 x 4 1/2	Cont.	6	19 84	1 - Strum.	Vacuum	Own	Own	Spicer	Timken	Own	Stewart	Firestone	6	Prent.	Wagner	Wagner	Delco	6	Saxon Y-18.
Sayers, A.	5	1625	118	32x4	Goodyear	3 1/2 x 4 1/2	Own	6	20 40	Zen.	Vacuum	B. and B.	Own	Arvac	Own	Own	Stewart	Firestone	6	Willard	Delco	Delco	Delco	6	Sayers, A.
Scripps-Booth 6-39.	5	1255	112	32x4	Goodyear	2 1/2 x 4 1/2	North.	6	18 99	1 - Mar.	Vacuum	North.	Own	Warner	Hess	J. C. W.	Stewart	Perman	6	Willard	Remy	Remy	Remy	6	Scripps-Booth 6-39.
Sanca H.	5	990	108	30x3 1/2	optional	3 1/2 x 4 1/2	LeRo.	4	15 63	1 - Scheb.	Vacuum	North.	Own	U. M. Co.	Adams	Ditweiler	Stewart	Prudden	6	Willard	A-C.	A-C.	Remy	6	Sanca H.
Singer, 19.	5	500	139	35x5	Goodyear	4 x 5 1/2	H-S	8	33 80	1 1/4 - Ray	Vacuum	Muncie	Own	Spicer	Timken	Own	Stewart	Firestone	6	Willard	West.	West.	Split.	6	Singer, 19.
Standard G.	7	2750	127	34x4 1/2	Firestone	3 1/2 x 5	Own	4	22 80	1 1/4 - Scheb.	Vacuum	B. and B.	Own	Spicer	Timken	Own	Stewart	Firestone	12	Willard	Remy	Remy	Delco	12	Standard G.
Stearns SKL-4.	5	2100	125	34x4 1/2	Goodyear	3 1/2 x 5 1/2	Own	6	25 35	1 1/4 - Strum.	Vacuum	B. and B.	Own	Spicer	Own	Own	Stewart	Kel-Stan.	6	Willard	Delco	Delco	Delco	6	Stearns SKL-4.
Stephens 76.	7	1855	126	33x4 1/2	Goodyear	3 1/2 x 5	Own	6	36 04	1 1/4 - Ball	Vacuum	Own	Own	Spicer	Own	Own	Warner	Kelsey	6	Willard	Wagner	Wagner	Delco	6	Stephens 76.
Studebaker EG.	7	1585	119	32x4	Goodyear	3 1/2 x 5	Own	6	29 40	1 1/4 - Ball	Vacuum	Own	Own	Spicer	Own	Own	Stewart	Kelsey	6	Willard	Wagner	Wagner	Delco	6	Studebaker EG.
Studebaker EH.	5	1125	112	32x3 1/2	Goodyear	3 1/2 x 5	Own	4	30 63	1 - Strum.	Pressure	Own	Own	Spicer	Own	Own	Stewart	Kelsey	6	Willard	Wagner	Wagner	Delco	6	Studebaker EH.
Stutz G.	6-7	2550	130	32x4 1/2	Templar	3 1/2 x 5 1/2	Own	4	19 60	1 - Zen.	Vacuum	B. and B.	Own	Own	American	Gemmer	Warner	Parker	6	Willard	Remy	Remy	Delco	6	Stutz G.
Templar 445.	5	2185	118	32x4	Firestone	5 x 3 1/2	Lyco.	4	19 60	1 - Zen.	Vacuum	B. and B.	Own	Spicer	Salisbury	Own	Stewart	Stanwell	6	Willard	Dyn.	Dyn.	Delco	6	Templar 445.
Tulsa, D.	5	1150	117 1/2	33x4	Goodyear	3 1/2 x 5 1/2	Cont.	6	25 35	1 1/4 - Ray.	Vacuum	B. and B.	Own	Arvac	Timken	Own	V. Sicklen	Firestone	6	Willard	Remy	Remy	Delco	6	Tulsa, D.
Veile 38.	5	1465	115	32x4	Goodyear	3 1/2 x 4 1/2	Cont.	6	29 40	1 1/4 - Ray.	Vacuum	B-L	Own	Spicer	Timken	Own	Warner	Firestone	6	Willard	Delco	Delco	Delco	6	Veile 38.
Westcott S-18A.	7	2590	125	32x4 1/2	Firestone	4 1/2 x 5 1/2	Cont.	6	27 23	1 1/4 - Ray.	Vacuum	Own	Own	Spicer	Timken	Own	Warner	Firestone	6	Willard	U. S. L.	A-L.	Delco	6	Westcott S-18A.
Willis-Knight 88-4.	7	1725	121	34x4 1/2	optional	4 1/2 x 5 1/2	Own	6	48 60	1 1/4 - Ray.	Vacuum	Own	Own	Spicer	Own	Own	Warner	Firestone	6	Willard	Bijur	Bijur	Bosch	6	Willis-Knight 88-4.
Winton 22-A.	7	3850	138	35x5	optional	4 1/2 x 5 1/2	Own	6	43 60	1 1/4 - Ray.	Vacuum	Own	Own	Spicer	Own	Own	Warner	Firestone	6	Willard	Bijur	Bijur	Bosch	6	Winton 22-A.
Winton 22-A.	7	3200	128	35x5	optional	4 1/2 x 5 1/2	Own	6	43 60	1 1/4 - Ray.	Vacuum	Own	Own	Spicer	Own	Own	Warner	Firestone	6	Willard	Bijur	Bijur	Bosch	6	Winton 22-A.

STEAM CARS

Stanley 735.....	7	3450	130	35x4 1/2	optional	4x5	Own	2	.....	none	none	none	none	Own	Warner	Warner	Firestone	6	.....	Willard	Remy	none	none	6	Stanley 735.
Post-Incoming: G. B. & S., Golden, Belknap & Swartz; T-McF., Tector-McFarlin; %, Monson or Duesenberg; R. & V., Root																									

Engines—Rutenber; Cont., Continental; Weid., Weidely; North, Northway; H-S, Herschell-Spillman; Lyco., Lycoming; D-Lyco., Dort-Lycoming; G. B. & S., Golden, Balknap & Swartz; T-McF., Teeter-McFarlan; S., Monson or Duesenberg; R. & V., Root & Van Dervoort; Carburetor—Strom, Strom; Zenith, Zenith; Ray, Rayfield; John, Johnson; Mar, Marvel; Sund., Sunderman; Stew., Stewart; H-K., Holley-Kington; New., Newcomb; Schab., Schabler; Tillot., Tillotson; Johns., Johnston. Generator and Motor—A-L, Auto-Lite; West., Westinghouse; #, Westinghouse or Auto-Lite; W-L, Ward Leonard; Dyn., Dyneco; N. E., North East; L-N, Leese-Neveville; A-C, Allis-Chalmers; Split., Splitdorf; S-N, Simms-Huff; G. & D., Gray & Davis. Ignition—A-K, Atwater-Kent; Conn., Connecticut; Eise., Eismann; West., Westinghouse; Will., Willard; N. E., North East; K-Remy, Kingston-Remy; Berl., Berling; Bosch-W., Bosch-Westinghouse; Split., Splitdorf. Gearset—G-L, Grant-Less; North., Northway; B-L, Brown-Lipe. Rear Axle—Col., Columbia; W-Weiss, Walker-Weiss; C-Timk., Cadillac-Timken; West-Mott, Weston-Mott. Universals—Hart., Hartford; Ther-H., Thermoid-Hardy; U. M. Co., Universal Machine Co. Speedometer—J-Man., Johns-Manville; V-Sicklen, Van Sicklen.

Sizes of Brake Linings for Cars

Motor Age Maintenance Data Sheet No. 36

One of a series of weekly pages of information valuable to service man and dealer—Save this page

1915 Models

INTERNAL				EXTERNAL			INTERNAL				EXTERNAL		
Car and Model—	Length	Width	Thick- ness	Length	Width	Thick- ness	Car and Model—	Length	Width	Thick- ness	Length	Width	Thick- ness
Inter-State—T	37	1¾	⅞	36	1¾	⅞	Owen Magnetic—O-36	20¾	2½	⅞	20¾	1¼	⅞
Jackson—44 & 46...	45⅝	2	⅞	42¾	1¾	⅝	Packard—All	53⅝	2½	¼	47½	2½	¼
*Jeffery—All	{40⅞ 20⅞	2 2½	⅞ ⅞	...	...	...	Paige—6-36	37½	2	⅞	35¼	2	⅝
King—C & D	41	2	⅝	38½	2	⅝	Paige—6-46	45⅝	2	⅞	42¾	1¾	⅝
KisselKar—All	88½	2	⅞	...	...	...	Pathfinder—6-cyl...	46⅞	2¼	⅞	34¼	2¼	⅞
Klinekar—All	101	2	⅞	75	2¼	⅞	Peerless—48-6	44	2¼	¼	...	...	...
Krit—L & M	33	2	⅞	30	1½	⅞	Peerless—54-56	43¾	2	⅞	38¾	2	⅞
Lenox—All	78	2	⅞	78	2	⅞	Pierce-Arrow—6-66..	20⅞	3¼	⅞	19	3	⅞
Lexington—6-L .....	...	...	...	15½	1¾	⅝	Pierce-Arrow—6-48..	18¾	3¼	⅞	16⅞	3	⅞
Lexington—4-K .....	...	...	...	15½	1¾	⅝	Pierce-Arrow—6-36-38	15¼	3	⅞	13⅝	2¾	⅞
Locomobile—All	48⅝	3	⅞	14½	2½	⅞	Premier—6-50	49⅞	2½	⅞	44¾	2½	⅞
Lozier—30, 32 & 34.	53½	2½	⅞	49	2½	⅞	Pullman	31⅞	1¾	⅝	27¼	1¾	⅝
Marmon—41	53½	2½	⅞	49	2½	⅞	R. C. H.	32⅝	1	⅝	...	1⅞	⅝
Maxwell—25	34⅞	1½	⅞	17⅞	1½	⅞	Regal	31½	2	⅝	29¼	1¾	...
McFarlan—All	51	2⅝	⅞	48	1⅞	⅞	Reo—R & S	43	2	⅞	38⅞	2	⅞
†Mercer—All .....	...	...	...	{47 12	2½ 2½	⅞ ⅞	Reo—M	43	2¼	⅞	38⅞	2	⅞
Metz	15	1	⅝	...	...	...	Saxon—A	21½	1¼	⅞	21½	1¼	⅞
Mitchell—B	44	2	⅞	40	1½	⅞	Saxon—S & S2	30½	1⅞	⅞	12	1⅞	3/8
Moline-Knight—B...	52	2⅝	⅞	52	1⅞	⅞	Scripps-Booth—C...	27⅞	1⅝	⅝	27½	1¾	⅝
Moline-Knight—E...	42½	2	⅞	41½	1¾	⅞	Singer—15	48½	2½	⅞	47½	2½	⅞
Monroe—M	27⅞	1¼	⅝	28½	1¼	⅝	Stanley—720	32½	1¾	⅞	35½	1¾	⅞
Monitor—All	34	1¾	⅞	...	...	...	Stearns—SKL4	25	3	¼	80	1½	¼
Moon—6-40 .....	...	...	...	40	2	⅞	Stevens-Duryea—D-6	...	...	...	14	2¼	¼
Moon—6-50 .....	...	...	...	46	2¼	⅞	Studebaker—EC	{34⅞ 42⅞	2½ 2½	⅞ ⅞	16⅞	1¾	⅞
National—All	50¼	2⅞	⅞	48¼	1⅞	⅞	Studebaker—SD & 5.	34⅞	2½	⅞	12	1¾	⅞
Oakland—37	37¼	1⅞	⅝	35⅞	1⅞	⅝	Studebaker—SD&EC	42⅞	2½	⅞	12	1¾	⅞
Oakland—49	42⅞	1⅞	⅝	40⅞	1⅞	⅝	†Stutz—F .....	...	...	...	{16½ 16½	1¾	⅞
Oldsmobile—55	49	2⅝	⅞	46½	1⅞	⅞	elie—15	40¾	2	⅞	40¼	2	⅞
Oldsmobile—42	37¼	1⅞	⅝	35⅞	1⅞	⅝	Velie—22	34¼	2	⅞	31½	1¾	⅞
Overland—80	41	2¼	⅞	10⅞	2¼	⅞	Westcott—U-50	42½	1⅞	⅞	41	1⅞	⅞
Overland—81	30⅞	2¼	⅞	9⅞	2	⅞	Winton—21	44¼	3	⅝	42½	2½	⅞
Overland—82	44½	2¼	⅞	13	2¼	⅞	Winton—21A	44	2½	⅞	40	2½	⅞

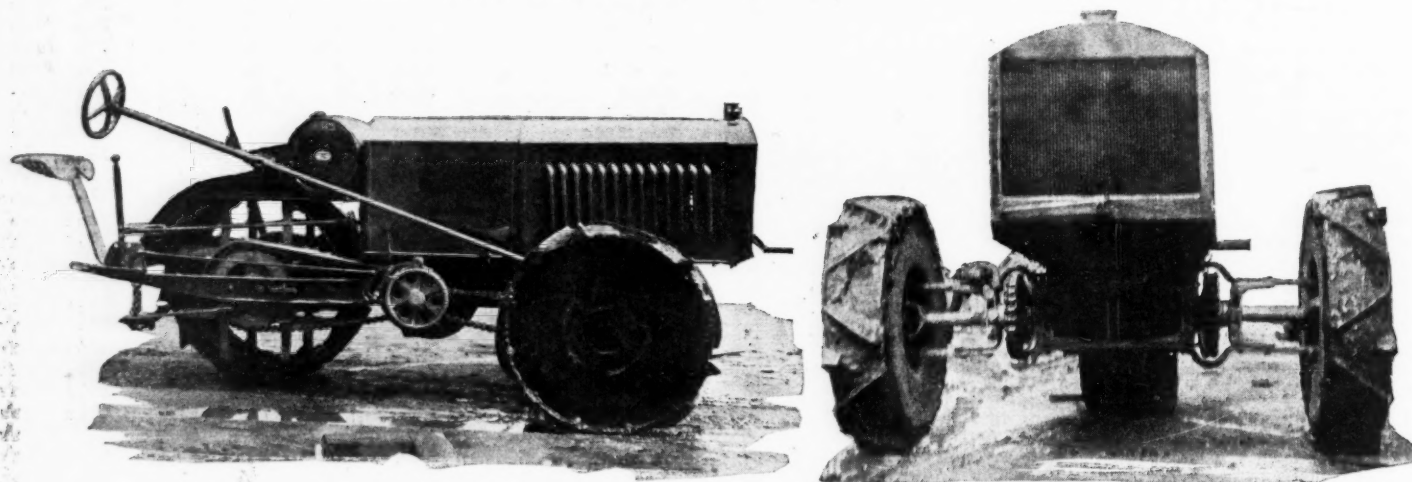
1916 Models

Abbott-Detroit—8-80.	54	2 1/4	1/8	50	2 1/4	1/8	Dort—5A	27 1/8	1 5/8	3/8	28 3/8	1 5/8	3/8
Abbott-Detroit—6-44.	36	1 3/4	1/8	36	2	1/8	Elcar—All	40	2	1/8	36	2	1/8
Allen—All	34 3/4	2	3/8	34 3/4	1 3/4	3/8	Empire—All	37	2	1/8	35	1 1/2	1/8
Alter—C	28 7/8	1 5/8	3/8	27 7/8	1 5/8	3/8	Fiat—All	20	2	1/4	22	2 1/2	1/4
Apperson—All	40	2 1/4	3/8	36 1/2	2	3/8	*Ford—T	23 3/8	1 1/8	3/8	No lining	...	...
Argo—All	23 1/2	1 1/8	1/8	16	1	1/8	*Franklin—All	{35 1/8 24	2 5/8 4	3/8 1/8	...	...	...
Auburn—6-38	42 1/2	2	1/8	...	...	...	Glide—6-40	41	2	3/8	40 1/2	2	3/8
Auburn—6-40A	49	1 1/2	1/8	...	...	...	Grant—V	34	1 3/4	3/8	31	1 3/4	3/8
Austin—66	42	3	1/4	42	3	1/4	Hal—21 & 22	48 3/4	2 1/2	1/8	44 3/4	2 1/2	1/8
Bell—A-16	28	2	3/8	24	1 3/4	3/8	Haynes—34 & 35 .....	...	...	...	15 1/2	1 3/4	3/8
†Biddle—D .....	...	...	...	{42 29	2 1 3/4	3/8 3/8	Hollier—All	37 1/8	2	1/8	34 1/8	1 1/2	1/8
Briggs-Detroit	34 1/8	1 1/4	1/8	23 3/8	1 1/4	1/8	Hudson—6-40	44 1/8	2	1/8	40 5/8	2	1/8
Briscoe—All	30	1 1/2	3/8	31 1/4	1 1/2	3/8	Hupmobile—N	41 1/4	2	3/8	39 7/8	2	1/8
Buick—D-54, 55	49 5/8	2 3/8	1/8	46 1/2	1 5/8	1/8	Inter-State—T	37	1 3/4	1/8	36	1 3/4	1/8
Cadillac—53	54	2 1/2	3/8	51	2 1/2	3/8	Jackson—34 (1st 500)	37 1/2	2	1/8	35 1/4	2	3/8
Case—T	40 7/8	1 7/8	3/8	40 1/8	1 5/8	3/8	Jackson—34B (bal.)	38 1/2	2	1/8	35 1/4	2	3/8
Chadwick—19	44	2 1/8	...	42	2	1/8	Jackson—68	44	2	1/8	42	2 1/4	1/8
Chadwick—21	44	2 1/8	1/8	42	2	1/8	Jones—All	37 3/4	2	3/8	35 3/4	1 3/8	1/8
Chalmers—	...	...	...	...	...	...	King—E	41	2	3/8	18 3/4	2	3/8
26-C & 32-B	43 1/2	2 1/8	1/8	41 3/4	1 1/8	1/8	Kissel-Kar—All	88 1/2	2	1/8	...	...	...
35-A	37 3/8	1 1/8	1/8	35 1/4	1 3/4	1/8	Klinekar—All	67	1 3/4	1/8	67	2	1/8
Chandler—All	45 1/8	2	1/8	43	1 3/4	1/8	Lenox—All	78	2 1/4	1/8	84	2 1/4	1/8
Chevrolet—490	27 1/2	1 1/4	3/8	26 1/2	1 1/4	3/8	Lexington—6-O	35	2	3/8	33	1 3/4	1/8
Chevrolet—H-4	35 1/8	1 5/8	3/8	35	1 5/8	3/8	Lexington—6-N .....	...	...	...	15 1/2	1 3/4	3/8
Cole—860	45	2	3/8	43 1/8	1 3/4	3/8	Liberty—10-A	37 1/8	1 1/8	1/8	23 1/8	2 1/2	1/8
Crawford—6-40	41	2	3/8	41	2	3/8	Locomobile—All	48 3/8	3	1/8	14 3/8	2 1/2	1/8
Cunningham—V-1	53 1/2	2 1/2	3/8	49	2 1/2	1/8	Lozier—30, 32 & 34.	53 1/2	2 1/2	1/8	49	2 1/2	1/8
Davis—6F & 6G	39	1 7/8	3/8	36	1 3/8	3/8	Marmon—34	53 1/4	2	1/8	47 3/8	1 1/2	1/8
Dispatch—All .....	...	...	...	20	1 1/2	1/4	Maxwell—25	34 7/8	1 1/2	1/8	17 7/8	1 1/2	1/8
Dixie—L	30 3/8	1 3/4	1/8	28 3/8	1 3/4	1/8	McFarlan—All	51	2 3/8	1/8	48	1 7/8	1/8
Dodge—All	42	2 1/4	1/8	14 7/8	1 3/4	1/8	†Mercer—All .....	...	...	...	{47 12	2 1/2 2 1/2	1/8 1/8
Dorris—1-B-6	43 1/2	2 1/2	1/8	40	2 1/2	1/8							

* Transmission brake. † Both brakes internal.



Two views of the Wetmore 12-25 tractor which is assembled at Sioux City, Iowa



About fifty tractors like this, John Deeres, are at work in South Dakota

Three Tractors for Northwest

John Deere, Dakota and Wetmore with
Their Main Features

THE urge of tractor production is likely to manifest itself anywhere. This is because the belief is general that the demand for tractors constantly will increase and because of the general impression that the machine altogether satisfactory has not been produced. However nearly correct this latter supposition may be, there are many who think they can improve on existing designs, and their ideas are being tried out here and there. The result is that one runs into new tractors constantly. Among such the three following, all being developed for the trade in the Northwest, present some points of interest.

John Deere

Ever hear of the John Deere tractor? Rumors were rife at one time that Deere & Co. were developing a tractor, but these grew vague after the company bought the Waterloo Gasoline Engine Co. and began selling the Waterloo Boy. Nevertheless the John Deere tractor exists and a half hundred or so are busily at work in the Jim River valley in South Dakota.

A tragic interest attaches to the John Deere tractor. It was designed by Joseph Dain. It was while testing out one of the models of this tractor up in South Dakota that Mr. Dain was stricken with the illness which so speedily resulted in his death.

The tractor department of Deere & Co. says the model is an experimental machine which was in process of development at the time the company bought the Waterloo Boy plant and that nothing has been done with it since. What the future of the tractor will be is problematical and the department cannot say at this time whether the design will be dropped or improved.

The John Deere approaches the drum type of tractor more nearly than it does any other. There is a broad, high wheel in the rear and two front wheels. But unlike all other such tractors it drives from all three wheels. Final drive throughout is chain.

The John Deere is unusual also in that it has no differential, a ratchet device serving such a purpose. Also all speeds are direct, there being no intermediate. High

speed is 25% and low speed 2 m.p.h. The weight of the machine is 4600 lb.

The engine was designed by Deere & Co. but built by Toro. It is four-cylinder, vertical, cast in pairs, with $4\frac{1}{2}$ by 6-in. bore and stroke. Lubrication is by force feed mechanical oiler combined with splash. Water is circulated by gear-driven centrifugal pump. Accessory parts are $1\frac{1}{4}$ -in. Stromberg carbureter, K. W. high-tension magneto and Bennett air cleaner. It has a 30-in. pulley, imparting a belt speed of 2190 r.p.m.

The clutch is a three-disk device of original design which also acts as the flywheel of the engine. This is directly connected with the transmission. The transmission is an exclusive type. There is no shifting of gears in the changing from high to low. A rod connects the hand speed lever with the middle member of the clutch. When this is moved forward the middle disk connects with the high-speed pinion. This pinion is in constant mesh with the high-speed forward bevel gear of the transmission. Moving the rod backward brings the mid-

dle clutch member into connection with the low-speed forward bevel gear of the transmission.

All three wheels are chain-driven, double chains being used, one pair extending backward to the rear drive wheel and the other forward to the front drive wheels.

Special attention has been paid to accessibility. Every part of the engine and transmission can be reached readily. For instance, there are hand holes in the right side of the crankcase so large that the connecting rods and pistons can be withdrawn through them. Also the engine has a removable head, making access to the valves easy.

Dakota

The Dakota Wide-Open-Drive-Wheel tractor is made by the Pope Mfg. Co., Wauertown, S. D., and sells for \$1,750. The company hopes to produce about 2000 machines this year.

The Dakota is a drum-type tractor, but the drum, instead of being solid, like the Gray, is open. This is the distinctive feature of the design. Angle irons, bent to about 15 deg. in the center, are bolted at center and ends to spoke wheels, of which there are three. The drum is chain driven at both ends, the power being taken from sprockets on the ends of a countershaft driven by straight spur gears from the engine crankshaft. The engine is set crossway of the frame.

The engine is a four-cylinder, vertical Dorman, with 4 $\frac{1}{4}$ by 6-in. bore and stroke, and the tractor is rated at 17-27. The engine is throttle governed and is lubricated by a gear-driven oil pump, combined with a splash. Accessory parts include K. W. high-tension magneto with impulse starter. Bennett carbureter and Bennett air cleaner. Bearings are high-grade babbitt, bronze backed. All gears are inclosed. Steering gear is heavy truck type, with extra heavy cast steel steering knuckles. The turning radius is said to be as short as that of any other tractor with equal wheelbase.

The front wheels are 34 in. in diameter with heavy staggered spokes and dust-proof hubs. The driving drum is 40 by 60 in. The drum shaft runs in double-size bearings. The belt pulley is 7 by 14 in. The tractor weighs 4400 lb.

The engine is protected by a canopy hood, and a hood also covers the driving drum. The frame is rigidly constructed of

channel steel. The front axle is built up.

It is claimed the Dakota never packs the soil and works especially well in loose or sandy soil. It will not work in wet gumbo, however, as the interstices of the wheels fill up and the machine loses traction.

Wetmore

A 12-25 tractor, weighing but 2900 lb. and selling for \$1,385, is being assembled by H. A. Wetmore, Sioux City, Iowa. The Wetmore is put out as a two-bottom tractor, thus giving plenty of reserve power, and is recommended especially for such work as disking, drilling, harrowing, harvesting, haying, manure spreading and the like. For the present it is not adaptable for belt work, since the form of gearset used runs the pulley backward. This will be corrected in future models. Crossing the belt, of course, would obviate this difficulty, but crossed belts are not as common as they used to be in steam tractor days.

Another peculiarity of the Wetmore is that a Torbensen rear axle is used. The present axle looks light for the demands which will be made upon it and Wetmore says he will have a heavier model for future construction. The model now being put out, he says, has been subjected to severe tests and the axle has stood the strain all right, but he admits a heavier design will be safer.

The engine is a four-cylinder, vertical, L-head Rutenber, cast in pairs with 4 $\frac{1}{8}$ by 5 $\frac{1}{2}$ -in. bore and stroke. Normally it runs at 960 r.p.m. but can be speeded up to 1500. Lubrication is a combination force

and splash. The accessory parts are standard as, for instance, Ideal radiator, Dixie magneto, Pierce governor and so on. The crankshaft has 11 in. of bearing surface.

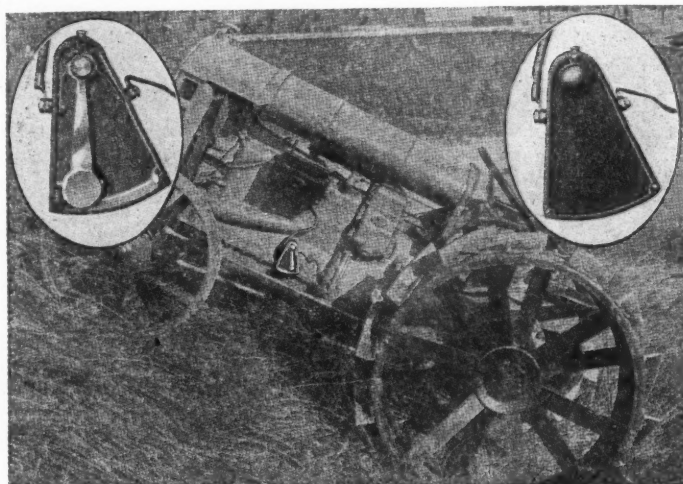
Transmission is ball bearing, selective gear type of Fuller design, with three speeds forward, direct on intermediate. Low gear speed is 1 $\frac{1}{2}$ and high gear speed is 4 $\frac{3}{4}$ m.p.h. Steering is through a motor car type of steering gear, and the turning radius is about 10 ft.

The Wetmore has a 74-in. wheelbase, 53-in. tread and 17-in. clearance at rear axle. The rear wheels are 46 by 10 in. and the front wheels 28 by 5 in. The belt pulley is 12 by 7 in. and is carried on ball bearings.

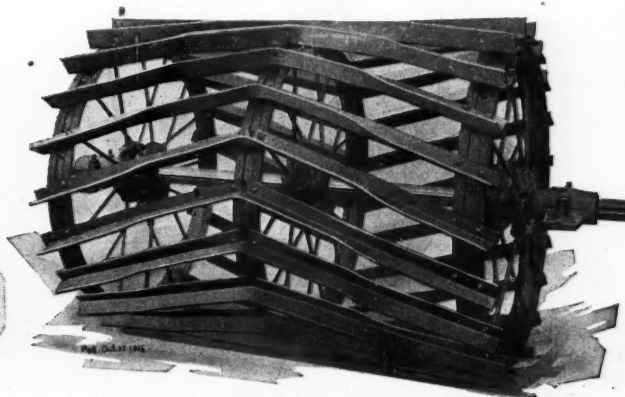
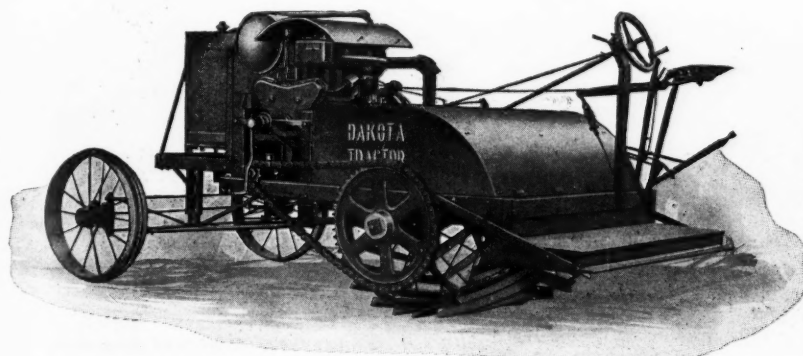
An obvious disadvantage of the Wetmore is its inaccessibility, which the designer admits but which he says could not be avoided in an assembled machine without enough production to insist upon special design of units.

APCO SAFETY SWITCH

Much has been said of the accidents to Fordson tractors due to tipping over backward because of careless driving when surmounting a large bump or a very steep incline. The upward momentum of the tractor combined with the turning action of the worm on the worm wheel has a tendency to make the tractor crawl up over itself. To overcome this the Apco Mfg. Co., Providence, R. I., has developed an automatic switch that shuts off the ignition on the engine when the tractor reaches a dangerous angle. The switch sells for \$6.



Apco automatic switch for tractors



The Dakota tractor sells for \$1,750, and it is hoped to make 2000 this year

Service Equipment

Time Savers of the Shop

Ingersoll-Rand Air Compressors

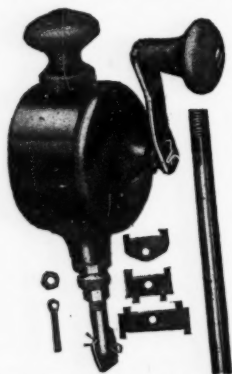
A NEW line of air compressors is offered by the Ingersoll-Rand Co., New York. The compressors are water-cooled, except the smallest type, which is air-cooled. The water-cooled pumps have the head as well as the walls surrounded by water. The capacities range from 3 to 45 cu. ft. a minute at pressures up to 200 lb.

Test Meter for Electric Circuits

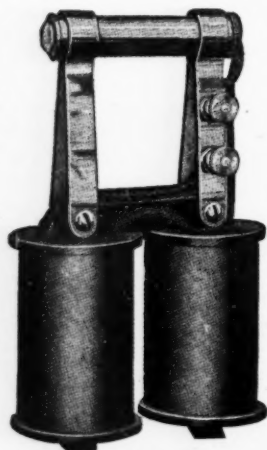
The General Electric portable volt-ammeter illustrated is suited for service station work in testing out circuits for opens and grounds. With a meter of this kind it is possible to quickly and accurately test storage batteries instead of shorting the terminals to test for a spark.

Ambu Armature Tester

The American Bureau of Engineering, Chicago, is manufacturing an armature tester that to the shop doing an extensive line of electrical repairing is a time saver. It will test any size armature and indicates the location of all shorts and open circuits. The tester handle with its contact points is slid over the surface of the armature, and the presence of an open circuit is indicated by the ceasing of the humming noise,



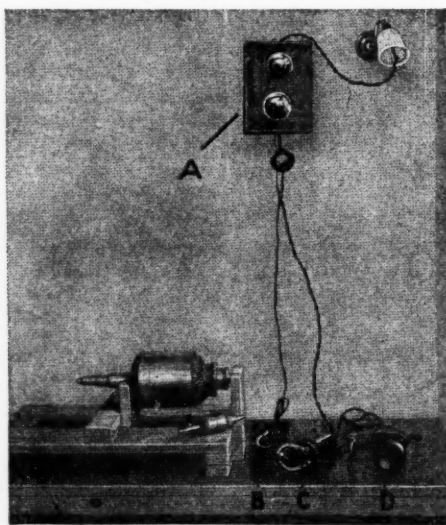
Sioux valve grinder



Benjamin magneto charger for Fords



General Electric portable volt-ammeter



Ambu armature tester for repairshop

or if a short-circuit is present, the lamps light up. It can be used on any 110-volt circuit, alternating current or direct current. It also can be used on 6-volt storage battery current by inserting a fuse plug in place of the lamps.

Berger Tire Rack

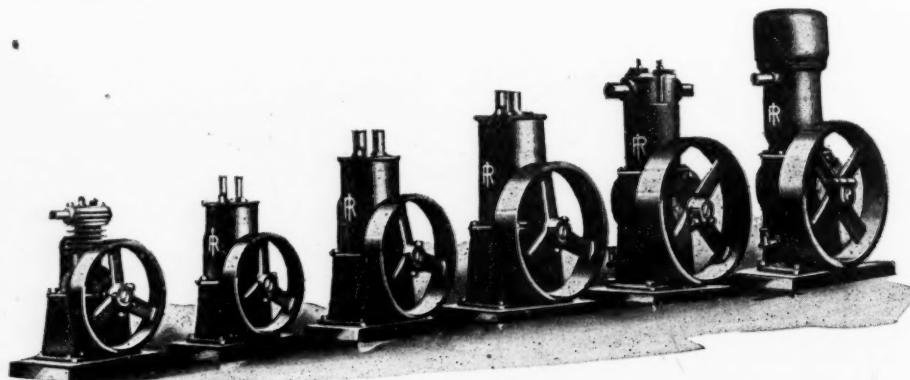
The Berger tire rack is entirely portable and can be adjusted to accommodate any size tire. The frame is bolted together and fitted with tie rods and cross-members so it is rigid. The tires do not rest on any sharp corners but on a triangular support bar that has the corners rounded over. The racks take care of business expansion, because they are made in units which can be added from time to time. This makes it possible to start out with a low initial cost, if desired.

Sioux Valve Grinder

The Sioux valve grinder is manually operated and gives to the valve a reciprocating motion while the handle is turned continuously in one direction. Any wear in the bearings is taken up by a spring, which does away with lost motion between the periods when the direction of rotation is reversed. The grinder comes complete with five styles of driving points and an extension shank for cars that do not have removable heads. The grinder sells for \$3.50 and is manufactured by Albertson & Co., Sioux City, Iowa.

Benjamin Electrical Specialties

A vapor-proof safety lamp for garage use is made by the Benjamin Electric Mfg. Co., Chicago. The bulb is surrounded by a vapor-proof globe and the whole is protected by a strong metal cage. The cord is heavily protected and is equipped with a special plug that will not wear the cord at the joint. The same company is making a magneto charger for Fords. It is operated from five or six dry cells or a 6-volt storage battery. The price for the recharger is \$7.



New line of air compressors put out by Ingersoll-Rand. All but the smallest type are water-cooled. It is air-cooled

The Accessory Corner

New Fitments for the Car

Taber Cut-Out and Muffler

THE Taber combined cut-out and muffler for Fords is a cast-iron device that takes the place of the regular Ford muffler. The construction and the method of attachment of this muffler makes it almost rattle-proof. It is made by the Emco Mfg. Co., Binghamton, N. Y. The price is \$4.75.

Jones Tachometer

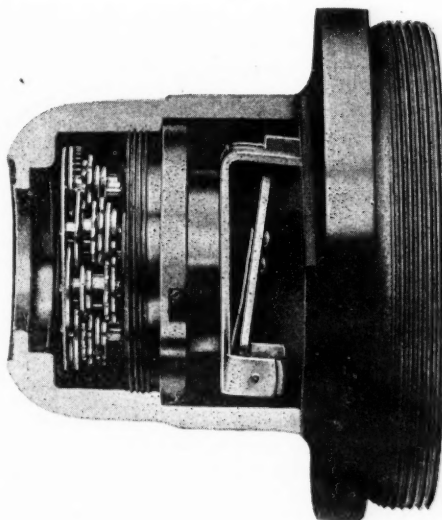
The Jones tachometer is an instrument that records engine speeds in revolutions per minute. For the large car with an extremely silent engine this instrument is especially valuable, as it tells exactly how fast the engine is revolving when otherwise it is impossible if the car is standing still. The tachometer is made by the Jones-Motrola Co., Inc., New York.



Jones tachometer which records engine speeds

American Hubometer

A hubometer that is applied without making a trip to the repairshop or service station is being made by the American Taximeter Co., 18 West Sixty-first street, New York. The difference between this meter and other meters of similar nature is seen in the method of drive. No permanent connection between the wheel and the meter is necessary, for a finger is provided that grips the castellations of the nut on the shaft. The meter is guaranteed against seepage of grease or from collision.



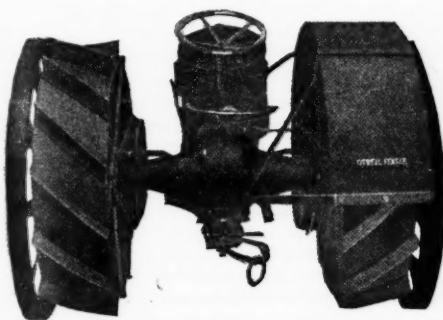
Cross-section of American hubometer

Ford Differential Gears

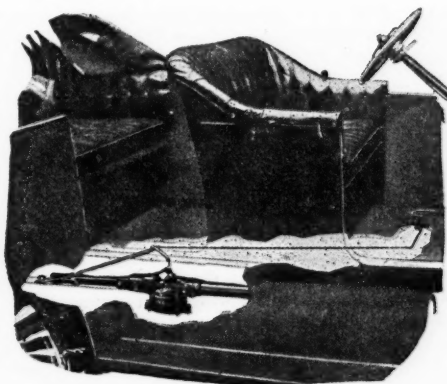
A set of differential gears interchangeable with the regular Ford set is being made by the Detroit Radiator & Specialty Co., Detroit. There are three ratios offered for the Ford, 2.75 to 1 for speedster use, a 3 to 1 ratio for ordinary driving, and 4 to 1 ratio for commercial work. The gears are made of nickel steel, sand blasted and hardened. The pinion and ring gear sell for \$15.

Fordson Accessories

The Otwell road bands and fenders for Fordson tractors, made by the Tractor Equipment Co., Detroit, permit the tractor to be operated on roads otherwise barred for tractor use because of the damaging effect of the cleats on the road, and the



Otwell road bands for Fordson



Taber cut-out and muffler installed

fenders add an element of safety to the driver, for stones and sticks that are picked up by the cleats cannot be thrown off in the driver's direction. The wheel bands lift the tractor off the road when driving on hard-surfaced highways, but when pulling in soft roads or fields the tractor sinks in beyond the depth of the bands and permits the cleats to take the load.

Clark Wheels

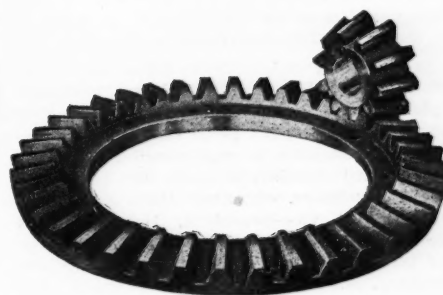
A new steel wheel for trucks that gives a large supporting surface, such as is needed for road-building purposes and the like, is offered by the Clark Equipment Co., Buchanan, Mich. The wheels are built for all makes of drive and readily can be interchanged for regular truck wheels when occasion so demands.

Moss Combination Lock

The Moss Auto Combination Lock Co., Detroit, is on the market with a new lock designed to free the wheel from the steering post and do away entirely with keys. It is a combination affair, and the owner is not bound to use the combination furnished when the lock is installed but can make his choice of almost 900,000 combinations. To release the locked wheel the operator must know the combination and he cannot change the combination while the wheel is disengaged.



Clark steel wheels for trucks



Detroit differential gear for Fords

Among the Makers and Dealers

Short Trade Notes

LA CROIX Is Rubay Vice-President—Paul LaCroix, general manager of the Rubay Co. plant, Cleveland, Ohio, has been elected vice-president of the company.

Marvel Is Service District Manager—W. E. Marvel of the Service Motor Truck Co. has been appointed district manager for the company in Utah, Colorado, Wyoming and parts of Mexico and Idaho.

Jerosch Heads Corbitt Office—Charles G. Jerosch has been appointed manager of the export office of the Corbitt Motor Truck Co., Henderson, N. C., which recently has been opened in New York.

Fisk Tire at Little Rock—J. R. Crossley, Arkansas representative for the Fisk Tire & Rubber Co., has moved his headquarters from Memphis, Tenn., to Little Rock, Ark., and now is located at the salesrooms of the Ollar-Overland Co.

Given Succeeds Tweedy—C. Given succeeds O. S. Tweedy, resigned, as vice-president and general manager of the L. A. Young Industries, Detroit. Mr. Given was representative of the Young Industries in Washington during the war.

Hubbard Machine in Hess-Bright Merger—The Hubbard Machine Co. also will be included in the merger taking in the SKF Ball Bearing Co., the Hess-Bright Mfg. Co. and the Atlas Steel Ball Co. under the name of SKF Industries, Inc.

Truck Sales Managers in July—The National Association of Motor Truck Sales Managers will meet in Detroit the latter part of July. This was decided on at the quarterly convention of the organization in Philadelphia. The date of the Detroit meeting will be given out later.

Republic to Build in Canada—The Republic Motor Truck Co. will put up a factory at London, Ontario, as its Canadian headquarters. A site already has been chosen, and the erection of the new plant will commence immediately. During the course of construction an old munition plant will be occupied.

Standard Becomes Mac-Lar Battery—The Mac-Lar Battery Co. is the new name of the Standard Battery Storage Co., Detroit, manufacturer of the Standard Master storage battery. Management of the company is the same. The officers are: President: Carl J. Larsen; vice-president, Charles C. Hansen; secretary, W. C. McNabb.

Lyons Back with Cutler-Hammer—H. S. Lyons, who for two years prior to his entry into the Aviation Service had charge of the sales of C-H electric devices in the territory covered by the Chicago office of the Cutler-Hammer Mfg. Co., Milwaukee, Wis., has received his discharge and returned to the employ of the company, doing sales work in the magnetic shift department.

Ignition Plug in Louisville Now—The Ignition Plug Co., Dayton, Ohio, has established a plant in Louisville, Ky., and is preparing to manufacture spark plugs on a large scale. The new company is capitalized for \$50,000 and several Louisville men are included among its officers, who are: President, E. R. Stucky; first vice-president, H. C. Smith; second vice-president, C. D. Hodman; secretary-treasurer, W. T. O'Neal, and assistant secretary, A. C. Reager. The company will make an improved spark plug, known as the

Tipco. It has established representatives in the principal cities of Indiana, Illinois and Kentucky and plans a nation-wide distribution.

Meissner Adds to Tire Lines—Sam Meissner, who operates three tire stores in Detroit, has just added the Gordon and the J & D lines of tires to his list.

Auto Specialties to Have Canadian Branch—The Auto Specialties Co. will build a branch factory in Windsor, Ont. It will be a duplicate of its plant at St. Joseph, Mich.

Thomas Opens Cleveland Office—Fred W. Thomas, formerly chief engineer for the Olympian Motors Co., Pontiac, Mich., has opened a consulting and sales office in Cleveland, Ohio.

Baumbach Joins International Concern—W. L. Baumbach has sold his interests in the Badger Tire Repair Co., South Bend, Ind., to become manager of the central district for the International India Rubber Corp.

Eisemann Nears Normal Production—The Eisemann Magneto Co. rapidly is reaching normal production. The plant is operating at full capacity with part overtime. Orders on hand will keep the plant at full capacity for some time.

Minnock Leaves Des Moines—Three hundred Ford dealers in the Des Moines territory gave a farewell banquet for P. F. Minnock, manager of the Des Moines Ford plant. Mr. Minnock has been made manager of the Kansas City branch.

Splitdorf Completes Government Work—The Splitdorf Electrical Co. has finished all Government work at its main plant and has closed down temporarily for inventory. Manufacturing activities will be suspended until May 5, when the Government inventory is complete.

Goodrich Tire Adding to Plant—The Goodrich Tire & Rubber Co. has taken out building permits for the construction of fireproof brick buildings to total \$93,000. A machine shop, costing \$49,000; an addition to a sub-station to cost \$15,000, and two additions to present buildings, costing \$29,000, will be built at once.

Fisher Now with Stone Tool—R. A. Fisher, for eighteen months with the flying corps, has joined the sales and engineering forces of the J. R. Stone Tool & Supply Co., Detroit. Before entering the service he was connected with the Curtiss Aircraft Corp. and the Continental Motors Corp.

Eccolene Increases Capital Stock—The Eccolene Mfg. Co., maker of the Eccolene oil, has increased its capital from \$10,000 to \$500,000. An advertising and sales campaign will start soon. F. C. Gumpfer is president of the company. Other officers are: Vice-president, Ralph de Palma; secretary, W. E. Bennett. The Edward A. Cassidy Co., New York, is the company's sales representative.

Peebles Becomes Armstrong G. S. M.—Arthur J. Peebles, former special representative of the Goodyear Tire & Rubber Co., has been made general sales manager of the Armstrong Rubber Co., Garfield, N. J. Mr. Peebles has traveled widely in connection with the rubber business and is also known to the trade as the former secretary of the Ohio Automobile Trade Association and an active worker in the affairs of the old National Automobile Trade Association. Arm-

strong recently completed a new factory and anticipates a production of 800 tires and tubes a day during the coming year.

Kirkland Is Detroit Sales Engineer—Arthur Kirkland, formerly with the Bureau of Aircraft Production, has been appointed sales engineer of the Detroit Tool Co.

Semmons Now with Chevrolet—H. G. Semmons, prior to the war with the Studebaker Corp., has joined the Chevrolet Motor Car Co., Flint, as assistant sales manager.

Hackett Plant Nearly Finished—Work is nearing completion on the new plant of the Hackett Motor Car Co., in Grand Rapids, Mich. This company recently moved there from Jackson.

Black Is Cleveland Vice-President—Sid J. Black is vice-president in charge of sales of the Cleveland Automobile Co., which is erecting a factory for the manufacture of the new Cleveland car.

Richman with Allen Company—J. F. Richman, former superintendent and factory manager of the Cole Motor Car Co., Indianapolis, Ind., is now manufacturing manager of the Allen Motor Car Co.

Reo Trucks for Mounted Police—Seven Reo motor trucks have been purchased for the Canadian mounted police. The machines are of the speed-wagon type and will be used in carrying supplies to isolated outposts.

White to Build Service Stations—The White Co. has purchased a site in Chicago upon which it will build a new service station. The property consists of approximately 5 acres. Plans for the building have not been fully decided upon, but preliminary reports indicate it will be two stories high and will cover a portion of the new property. Heretofore the White Co. has operated on leased land in Chicago. In addition to enlarging and strengthening its service station in Cleveland, the company has completed a service station in Philadelphia and has purchased land in Long Island City, where a large station will be erected to take care of the New York territory.

Duplex Engine Governor Adds to Force—J. K. Cravens has been appointed sales manager of the Duplex Engine Governor Co. He formerly was connected with the Excelsior Motor & Mfg. Co., Chicago; the F. A. Ames Co., Owensboro, Ky., and more recently with the Wright-Martin Aircraft Co., New Brunswick, N. J. George L. Ritter, who has been with the company for several years, has been promoted to assistant sales manager. J. N. Ryan, recently discharged from the Air Service as a pilot, will cover New York, New Jersey and New England. R. Weston Doherty, who, it was recently announced, would cover this territory, will not be connected with the company.

Central Garage to Park Cars—The Central Garage Co. has been incorporated at Akron, Ohio, with a capital of \$500,000, and a building to house the sales and service departments of the company will be erected at once. The building contract calls for an expenditure of \$450,000. The structure will be 400 ft. long, 150 ft. wide, four stories high, with a floor space of 48,000 sq. ft. on each floor. The garage will have a capacity of parking 4000 cars. John A. Brittain is secretary and treasurer. He states that it is the purpose of the

company to attempt to have the new garage answer for a place in which to park cars, thus keeping them off the streets. The officers are as follows: President, James P. Loomis; vice-president, George W. Billow.

Rex to Make Automotive Air Equipment—The Rex Machine Co. has been organized in Chicago to make the Rex line of automotive air equipment. This will include Rex valveless engine-driven tire pumps and service station air equipment.

Pennsylvania Rubber Declares Dividends—The Pennsylvania Rubber Co., Jeannette, Pa., has declared its regular quarterly dividend of 1% per cent on preferred and 1½ per cent on common, payable June 30 to stockholders of record June 15.

Big Increase in Mack Sales—Sales for March made by the International Motor Co. showed the biggest increase of any month since the signing of the armistice. Fully 50 per cent of the orders, the company reports, are for Mack heavy-duty trucks.

Cravath Becomes Wheat G. M.—L. B. Cravath, formerly western sales manager of the Cleveland Tractor Co., has resigned to become vice-president and general manager of the Hession Tiller & Tractor Corp., Buffalo, N. Y., maker of the Wheat tractor.

To Handle Accessories Wholesale—The Crow-Burlingame Co. has been organized at Little Rock, Ark., with a capital stock of \$100,000 to handle accessories, garage equipment, etc., wholesale only. The officers are: President, W. R. Crow; secretary, J. G. Burlingame, and treasurer, W. A. Harb.

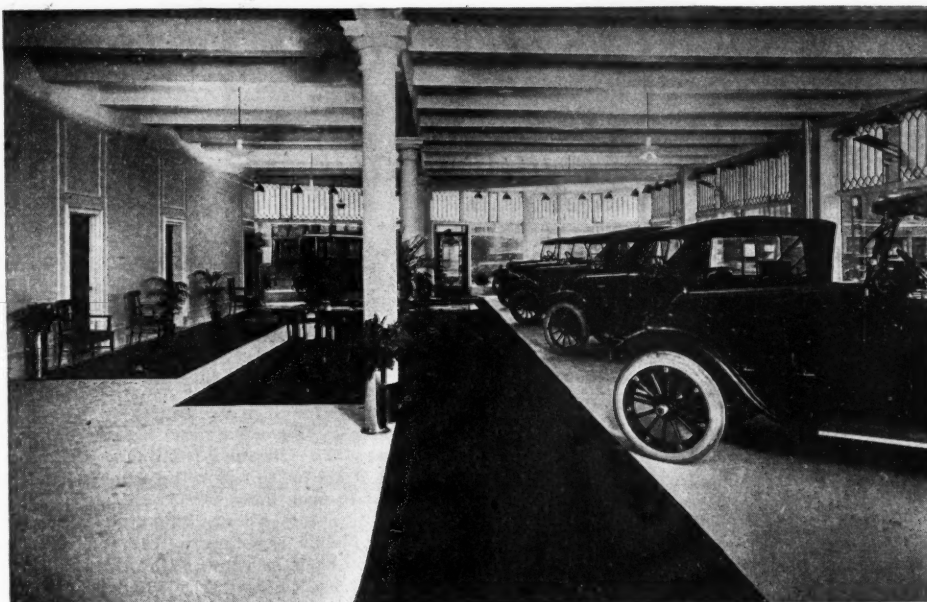
Canadian Agents for Wheat Tractor—The Hession Tiller & Tractor Corp., Buffalo, N. Y., has placed contracts for its product, the Wheat tractor, with the Wheat Tractor & Implement Sales Agency in Saskatchewan, Canada. Branches will be established at Regina and other points, while headquarters will be at Saskatoon.

Vacuum Muffler in South Africa—R. C. Woodville, manager of the Cycle & Motor Supply Co. of South Africa, who has been in this country for several months, has made arrangements with the Vacuum Muffler Corp. of America to handle its vacuum muffler exclusively in that country. The concern has branches in Cape Town, Johannesburg and Durban.

Webb Back in Automotive Game—A. C. Webb, formerly head of the Webb Motor Fire Apparatus of St. Louis, Mo., but more lately captain in the Army and in charge of motor truck production in motor car factories, has been mustered out and has organized the A. C. Webb Motor Car Co. in Indianapolis, Ind. He will act as Indianapolis distributor for the Moon car, and his contract calls for 400 of the post-war models.

U. S. Rubber Elects—Samuel P. Colt has been elected chairman of the United States Rubber Co. Officers are: President, Charles B. Seger; vice-presidents, James B. Ford, Homer E. Sawyer, Elisha S. Williams, J. Newton Gunn, Ernest Hopkinson and W. G. Parsons; treasurer, W. H. Blackwell; comptroller, W. G. Parsons; secretary, Samuel Norris; assistant secretary and treasurer, John D. Carberry; assistant comptrollers, H. B. Hubbard and W. O. Cutter.

Changes in Owen Magnetic Sales—E. S. Partridge Co., Inc., is the new name of the Owen Magnetic Motor Sales Corp., which handles the Owen Magnetic and Liberty in New York. The change in name is coincident with the occupation of a new sales and service building. Mr. Partridge affiliated himself with R. M. Owen to develop the Owen car about five years ago and became president of the Owen Magnetic Motor Sales Corp. He is president of the new company, which recently has taken on the Lapeer trailer formerly marketed under the firm name of



STUDEBAKER REJUVENATES NEW YORK SALESROOMS—The interior of the Studebaker establishment on Broadway in New York has been entirely redecorated in white, broken by the cars themselves and heavy rugs of a rich brown. A large wheel nameplate, facsimile of the radiator insignia, has been erected on the building and is electrically lighted and operated. Entrance is now by a double doorway from Broadway

Trailer Co. of New York and a subsidiary of the Partridge organization. Fred Titus remains sales manager and Julian Halford treasurer.

Holihan Joins Garford Truck—J. S. Holihan, former sales manager of the Standard Motor Truck Co., Detroit, has joined the sales force of the Garford Motor Truck Co., Lima, Ohio.

Brubaker Is Transferred by I. H. C.—H. L. Brubaker, manager of the Madison, Wis., branch of the International Harvester Co., has been transferred to the general offices at Chicago. He is succeeded by B. B. Reppert, who has been manager of the branch at Dubuque, Iowa for several years.

Bedore Is Nash Service Manager—William Bedore, Kenosha, Wis., has been appointed manager of the service department of the Nash Cincinnati Motors Co., Cincinnati, Ohio. During the war Mr. Bedore occupied a position in the factory service department. He has been with the Nash interests and predecessors for six years.

Loftus Is Wheat Factory Representative—R. A. Loftus has been made factory representative of the Hession Tiller & Tractor Corp., Buffalo, N. Y., maker of the Wheat tractor. He was previously assistant sales manager of the Cleveland Tractor Co., having sold the first machine of that make offered for sale. He will proceed to organize the sales force in the eastern section of the United States.

Schwartz Electric Back in Peace Work—The Schwartz Electric Co., Adrian, Mich., which during the war produced munitions, has returned to peace activities, the manufacture of horns and other motor supplies. The company has orders now to supply thirty-two manufacturers. The company is making 1800 small horns a day, 800 large ones, 1000 circuit breakers and 1200 push buttons. Cord assemblies also are being manufactured.

Klumb Engine Now Liberty Tractor—The Klumb Engine & Machine Co. has been reorganized under the laws of Iowa as the Liberty Tractor Co. and is moving its equipment and offices to Dubuque, Iowa. Paul Klumb, president and manager of the Sheboygan company, will continue to be associated with the interest. At Dubuque a new plant is being erected. The first structure, a machine shop, 80 by 180 ft., is ready for occupancy. An assembling floor and gas engine shop, 60 by

300 and 100 by 250 ft., respectively, will be built during the summer. Practically the entire output until Jan. 1 has been contracted for.

Vulcan Moves to Kansas City—The Vulcan Spring Co. has moved its St. Louis branch to Kansas City, Mo., and hereafter St. Louis territory will be served from that point.

Berge Is with Champion Ignition—J. Berge, formerly of the Stewart Warner Speedometer Corp. has been appointed chief engineer of the speedometer department of the Champion Ignition Co., Flint, Mich.

Saginaw Is G. M. Holding Company—The Saginaw Products Co., a division of General Motors, has been organized as a holding company. It will conduct the business of the Jackson-Church-Wilcox Co., the Saginaw Malleable Iron Co. and the Central Foundry Co. The business of the new company is set forth as the manufacture, buying, selling and dealing in cars, trucks, tractors, boats, airplanes, vehicles of every description, their parts and accessories and the conducting of a general manufacturing and mercantile business.

Kenosha Wheel & Axle Organizes—The Kenosha Wheel & Axle Co. is being organized at Kenosha, Wis., with capital of \$550,000 as a development of the Whitcomb Tool & Machine Co. The new company will specialize in the manufacture of internal spur-gear drive axles and in a new type of all-steel wheel for commercial cars. James A. Whitcomb, proprietor of the old concern, will be president and manager. For the present time Whitcomb shops will serve as a factory, but a site is being purchased whereon to build a complete new manufacturing group.

Badger Getting Ready for Production—The Badger Aluminum Co., organized at Sheboygan, Wis., to manufacture aluminum castings and sheet aluminum goods, is equipping the first unit of its factory, which is to begin operations about July 1. New machinery and equipment costing about \$25,000 have been purchased and are being installed. This includes a 20-ton press for making stampings. The capital stock of the new company is \$50,000. August Johannes, formerly with the Two Rivers plant of the Aluminum Goods Mfg. Co., Manitowoc, Wis., has become works manager of the new Sheboygan concern.

From the Four Winds

Glimpses at the World of Motordom

TRACTOR School at Minnesota University—A four weeks' tractor school for tractor operators will be opened May 19 at the University of Minnesota school of agriculture. William Bass, division of farm engineering, will have charge of the school.

Indianapolis Extends City Motors—Two motor street flushers, two motor road rollers, four tractors and two motor gravel trucks have been bought by Indianapolis, Ind., in an extensive program of motorization of city equipment begun last year. The use of motor trucks is to be extended considerably.

To Complete Akron-Cleveland Road—Construction of the entire 17 miles of the Akron-Cleveland market highway this year is assured, following the action of the state highway department in apportioning \$15,000 a mile for the second section of 8½ miles of highway. The action is the sequel to a telegram shower enjoyed by Governor Cox, dozens of Akron citizens and concerns informing him that the construction of the highway was an absolute necessity.

Wisconsin Setting New Registration Mark—Wisconsin is breaking all previous records for registration. April 5 more than 150,000 licenses for cars had been issued, while applications on hand numbered at least 7,500 additional. A year ago the number of licenses actually issued was less than 75,000. The total for 1918 was 189,983. So far 6,450 truck licenses have been mailed, compared with 3,500 a year ago. Total receipts from license payments so far this year amount to nearly \$1,625,000. Cars pay \$10; motor trucks a sliding scale from \$10 to \$25, and dealers, \$25.

Delaware's Last Toll Passes—Through the generosity of Pierre S. duPont, the last toll road in Delaware is about to pass out of existence. It extends from Wilmington to the Pennsylvania state line, about 7 miles, in the direction of Kennett Square, Pa. With the stock of the company worth at present \$25 a share, he has offered to buy all of it at \$50 a share, also to pay the company \$10,000 additional with which to liquidate current obligations, aggregating about \$8,000. His offer was accepted. Mr. duPont announces that when the road is turned over to him he will build on it a new 24-ft. concrete highway on an 80-ft. right-of-way to the Pennsylvania state line. From that point he is now completing a similar road to his summer residence at Mendenhall, Pa. Mr. duPont will

make the whole highway a free road for the use of the public. All other toll roads in Delaware have gone out of business, their property having been acquired by the counties.

Business Booming in Massachusetts—Some idea of the way business is booming in Massachusetts is found in the figures of the highway commission for the first three months of this year. The receipts from motorists has reached \$1,522,786.66. For the same period a year ago it was \$1,190,962.55, an increase of \$331,817.11, or 29 per cent. The highway commission officials say that within the rest of the year to register vehicles the total will be at least \$2,500,000 for 1919. There had been issued 113,000 plates for cars so far this year. The highest number for 1916 was only 102,000, and the total in 1917 was 126,000. Last year it was 146,000, so the 1918 figures will be overtaken in a short time.

Chambers of Commerce in Road Work—Chambers of commerce of western New York have united in a campaign expected to result in early improvement of that portion of the Cleveland-Buffalo highway between Silver Creek, N. Y., and the Pennsylvania state line. This portion of a much traveled highway is in fair condition in dry weather, but after long rainy seasons it is hub deep in mud. There is improved road from Buffalo to Silver Creek, also from Cleveland practically to the Pennsylvania state line, but between these points is a soft road which has long been a nightmare for tourists coming to New York and the east from Cleveland and points west. Efforts will later be made to have the Pennsylvania section of the road improved.

Safety-First Campaign Planned—The Detroit Automobile Club is to hold a safety-first campaign to make Detroit's streets safe. The tentative date for the campaign opening is May 15. Details of the campaign were discussed at a recent meeting of the Safety-First committee, and one of the important acts of this committee was the pledging of the club's support to Mayor James Couzens in his work to make the streets safe. The club believes that the enormous number of accidents resulting on the streets, by concerted effort can be materially reduced, and that any action tending toward reduction of these accidents is worthy of the immediate effort of those having the best interests of

the city at heart. The club will co-operate with the police department in its safety-first work.

Delaware Road Prospects for 1919—From present indications \$2,000,000 worth of new road work will be contracted for in Delaware this year, as against \$1,300,000 worth last year. State funds in this behalf will be boosted by the Government to the extent of \$450,000.

Michigan Ready for Road Work—The Michigan highway department is preparing to spend from \$3,000,000 to \$5,000,000 this year on roads. The favorable vote on the \$50,000,000 good roads issue has given the legislature new lease of life. To carry out the good roads program it will be necessary to call an extra session after May 7. Attorney General Groesbeck has held the road bill may be introduced now and left in abeyance until all restrictions in the state constitution have been complied with.

Decision in Streetcar Case for Motorist—A new rule of law in cases involving crossing accidents was enunciated by the supreme court of Wisconsin in the appeal of Edward J. Dahinden of Milwaukee from an adverse judgment rendered by both the civil and circuit courts of Milwaukee county in his suit for damages against the Milwaukee Electric Railway & Light Co. The decision in effect holds that a motorist who approaches a streetcar track over which a streetcar is about to pass and makes calculations as to whether or not there is time to cross in advance of the streetcar at a distance of between 15 and 20 ft. of the tracks cannot be held guilty of contributory negligence. Mr. Dahinden brought suit for damages in the civil court. At the conclusion of the trial the court directed a verdict in favor of the defendant street railway company on the ground that plaintiff was guilty of contributory negligence as a matter of law. On the appeal to the circuit court by Mr. Dahinden, the lower court's judgment was sustained and he appealed to the highest state court, where the verdict was reversed.

Took Away 2,166 Licenses in 1918—During 1918 the Massachusetts highway commission suspended or revoked 2,166 driving licenses and in addition took away the registration certificates of 177 motor vehicles. Of the suspensions and revocations, 1,083 followed automatically upon convictions in court of serious offenses and thirty-six were caused by complaints upon which hearings were given. The largest number of cancellations, totaling 1,224, came about from investigations conducted by the examiners of the commission. The licenses revoked numbered 811; those suspended were 957, while in 398 instances the right to operate in Massachusetts was taken away. Reckless operation caused 239 revocations or suspensions; operating under the influence of liquor was responsible for 553 being dropped, refusing to stop after an accident led to the taking away of seventy-five others; accidents resulting in death automatically suspended 471, and 274 were deprived of the right to drive because of improper operation. The highway commission now has a blacklist containing the names of 3,400 who cannot get a license to drive cars in Massachusetts. In addition there are thirty-nine others who cannot even register a motor vehicle.

Coming Motor Events

SHOWS

Bristol, Va. May 10-17

MEETINGS

Hot Springs, Va. Automotive Equipment Association June 2-6

RACES

Indianapolis, Ind. May 31
New York June 14
Tacoma, Wash. July 4
Cincinnati, Ohio July 5
Uniontown, Pa. July 19
New York July 26
Elgin, Ill. Aug. 22-23
New York Aug. 23
Uniontown, Pa. Sept. 1
New York Sept. 20
Cincinnati, Ohio Oct. 1